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A FEW OPINIONS ON A BURNING QUESTION.

THE Poor Law Commissioners, as our readers know very well, have voiced the demand for A MORE PRACTICAL EDUCATION in our primary schools, with the direct object of preparing pupils for taking up industrial life. The appearance of their Report, recently issued, has stirred up public men, employers of labour, education authorities, trade-unionists, and educationists—both theoretical and practical—in a most remarkable manner. Meetings have been held in all parts of the country to consider the questions of preliminary technical training and of apprenticeship. There will undoubtedly be in the near future some practical result of all the discussion, and our readers are strongly recommended to watch the movement very closely, for it concerns the daily life and professional prospects of EVERY EDUCATIONAL WORKER IN THE COUNTRY.

This is a matter which the public has clearly taken into its own hands, and there is going to be a national demand that the Board of Education should frame a curriculum which will prepare elementary school pupils to take an intelligent and competent part in the industries of the country.

This is no mere fad, which will end in paper-cutting and more or less dexterous manipulation of a gum-pot. It does not mean the mere addition of another "subject" to next year's Code. It means a revolution in the entire practice of elementary education. It means a reorganisation of continuation school work, *and, incidentally, more opportunities for teachers who have a liking for technical subjects.* It means new schemes for dealing with the pupil-artisan, and a closer link between the enlightened employer and the capable teacher.

We have asked PROFESSOR M. E. SADLER to give us the benefit of his opinion on the matter, because we feel that our readers can trust implicitly to his guidance; and in our next number we hope to print an article from his pen, dealing with preliminary technical training and apprenticeship. In the present issue (see p. 496) we offer for the consideration of our readers a paper by Mr. Ben Tillett, the well-known secretary of the Dockers' Union. This contribution will, we think, afford matter for deep thought among those who are accustomed to look at a question from all possible points of view. We have ventured to emphasise certain of Mr. Tillett's observations as leading up to really practical conclusions on the matter under discussion.

We give below three weighty opinions, drawn mainly from recent public utterances of prominent men of affairs. These will, we hope, serve to indicate the trend of public opinion upon what we call, without exaggeration, a burning question.

Sir Donald Macalister, Principal of Glasgow University, recently dealt with the work of the continuation schools, and gave utterance to opinions which ought to be studied by every teacher who is watching developments and opportunities in his own profession.

During the seven years of adolescence, he said, the youth's character was forming. He should be acquiring the self-control and the skill and knowledge that would make him effective when he was ready for a man's work and a man's place in the world. He had been doing what was essentially a boy's work and nothing more, with little that was preparatory or educative about it. At twenty-one he was still too often merely a belated and superannuated boy, capable only of unskilled work when he could get it, and drifting speedily into the ranks of the unemployable when he could not. How should they supplement such a boy's casual work by some training that would look beyond boyhood and fit him to enter the adult ranks as an efficient? How would they find, in fact, an educational substitute for the old apprenticeship which made a youth into a craftsman and prepared him to become by-and-by a master workman.

Changes in trade and industry had made apprenticeship obsolete or unattainable for multitudes. It was, he believed, to continuation classes organised by the School Boards that the country must look for the training, supplementary and subsequent to primary education, which must take the place of apprenticeship for a vast proportion of our youth.

The task of organising such training was a heavy one, but the welfare of the State demanded that it should somehow be fulfilled. When they left out the numbers—considerable indeed, and, they might hope, likely to increase—who were able to pass on to central institutions—the technical college, the school of art, the commercial college, and other places of specialised education adapted for the commissioned and non-commissioned officers of industry—there would always remain a host of the rank and file, the privates of the industrial army, for whom the continuation class furnished the only avenue to that post-primary knowledge and training on which adult efficiency must be based. For these young people they had to ensure that the education imparted at such cost during childhood would not be wasted and dissipated in adolescence; they had also to ensure that it would be supplemented and become fruitful as a sound preparation for useful manhood.

Much had yet to be done to frame courses suitable for the various needs, to find space for the numerous classes, and *to procure teachers with the required powers,* experience, and temperament before general compulsion could be exercised. Yet who could doubt that there were thousands of boys and girls who would be benefited for life by such a measure of educational conscription?

The italics in the foregoing are our own. The teachers must be drawn from the ranks of the present educational army. But those who wish to be chosen *must prepare for this special work* in a manner with which we hope to deal in a future issue.

Sir Thomas Wrightson, the famous engineer of Stockton-on-Tees, spoke last month at a London conference on apprenticeship.

He had been asked, he said, to describe a system which had been adopted in a large engineering establishment in the north, of which he was chairman. It had been successful in creating among the boys the greatest interest in their work, and had also produced among the parents a loyal desire to put their sons under the regulations imposed.

The bound-apprenticeship system, which did so much for the training of artisans before the large factory system started, had lapsed almost entirely owing to the difficulty of enforcing discipline when the masters had not the power of dismissal. He did not wish to go into the question of how the bound-apprenticeship system had been discouraged. It was enough to recognise that such was the present condition of matters, and the problem was how to establish a form of education which would replace the old system of apprenticeship to a handicraft which was the lineal descendant of the old trade guilds.

The difficulties which confronted a solution of the problem were four in number—namely, apathy of parents, apathy of employers, apathy of trade-unions, and apathy of the older workmen.

The apathy of parents was due to the fact that they often preferred their boys to earn the comparatively higher wages as a youth-labourer than the smaller apprentice wages which obtained while the skilled trade was being taught. The apathy of employers was due to the fact that they felt that if they did train up a number of boys, they left just when their experience was of real value, and went to an employer who had not taken the trouble to train apprentices. The apathy of trade-unions was shown by the fact that it was no longer an observed rule, in order to be a member of most of the larger unions, to have that all-round training which made a really skilled artisan. The apathy of older workmen amounted almost to jealousy, and might be considered natural if the man thought that he might be superseded by giving away the secrets of their craft to a younger and more active man.

In these days of highly specialised subdivision of labour, *unless a boy obtained the mastery of more than one special operation in his trade his chance of employment was seriously diminished*, and when he became a man his place was taken up by another boy, and he tended to drift into the ranks of the casual labourer.

In his works they were trying a scheme of their own. They had placed as teacher over the boys the junior foreman in each department, the idea being that the junior foreman being the man who during the day superintended the daily work of the boys would, through the knowledge he obtained of the character of each boy, be the best man to teach them in the evening the theory of the various operations he had to attend to during the day.

That theoretical teaching could not be given during work hours, but knowing the exact work each boy was engaged in, the junior foreman, always a highly-skilled workman, could readily communicate a sufficient amount of theoretical teaching to arouse interest in the boys and develop their minds in the direction required to make them thinking artisans.

This effort had been most successful, and the keenness of the boys to attend the classes and their attention to the instruction were enabling the firm to turn out most promising young workmen. It was not claimed that the theoretical teaching was of a very high character, but it was sufficient to draw out the best qualities of the boys, and in some cases when boys showed exceptional ability the firm sent them, and paid their expenses, to attend local continuation schools, where higher forms of theoretical teaching became useful.

The italics are once more our own, and serve to emphasise a sentence full of suggestion for observant readers. In our opinion, the theoretical teaching mentioned above *ought* to be of a high character, and Sir Thomas Wrightson and others *ought to send into the works duly qualified experienced teachers* capable of imparting it in the best possible manner. With a little extra training, many elementary teachers could fit themselves for posts of this kind. But we intend to return to this matter in a later issue.

Sir George Gibb, Chairman of the Metropolitan Underground Railways, also spoke at the same conference.

He observed that one object of the meeting was to consider what could be done to cure a very grave defect in their educational and industrial organisation. *The critical passage from education to employment, upon which largely depended the question whether the value of training was to be realised or wasted, was left to haphazard chance.* They must never forget that their greatest national asset, without which capital would be fruitless and barren, were the skill and industry of the people. He suspected that much of that asset was being allowed to run to waste. The value of training was frequently lost, unsuitable employment was encouraged, and unemployment, not only among the working classes, but in many walks of life, was created by defective organisation. The remedy was by systematic organisation and method to bring training into closer and better relation to the object of training, which, after all, for most people was not personal culture, but the more practical and pressing object of getting work to earn a living.

Teachers can help in the matter of making the passage from education to employment less critical in a manner with which we hope to deal in next month's *Practical Teacher*.

Mr. James Baker, F.R.G.S., sometime Special Commissioner of the Board of Education in Central Europe, spoke at the North of England Education Conference on this subject:—

Schoolmasters who have taken interest in the after-life of their pupils, he said, have bitterly complained that their boys were going out into life not knowing what they might do. They were powerless to direct them. Lads who had been educated for junior clerks were going out as errand boys, and boys who perchance were born inventors drifted into selling newspapers, or became porters and packers, and lads who were keen upon the earth and its products wandered into towns to find nights' lodgings on the Embankment or a doorstep.

Our system of elementary education has buried the genius of our people, and killed the race of inventors who placed us in bygone days in the forefront of nations.

Genius! The capacity for invention, the power of development, or the strength for organisation, may be found anywhere—in slum, or suburban, city, or rural school. The duty of elementary education is to so prepare the foundation that, being linked with the technical (and by technical I here include all technics), the edifice of intelligent craftsman, keen agriculturist, the man of science or invention, or the capable man of commerce may be built up. That something is wrong with our system, and that the system of other nations is producing better results, is amply evidenced by the fact that every modern invention comes from abroad—motors, telephones, wireless telegraphy, aeroplanes, radium, X-rays, synthetic indigo, artificial silk, incandescent gas light, Osram burners, agricultural machines, hosiery machines, dentistry, mathematical instruments, etc., etc.

You men of the North of England can probably add to this list of all new inventions of the last few years that are not British inventions; whereas forty years ago, if one travelled in Europe, all developments, all advancements, even all articles of special utility and especial quality, were English.

Modern Apprenticeship.

BY BEN TILLETT, GENERAL SECRETARY OF THE DOCK, WHARF, RIVERSIDE, AND GENERAL WORKERS' UNION OF GREAT BRITAIN AND IRELAND.

THE ideal of apprenticeship is dead, and the utility of apprenticeship is questionable. The machine is master rather than the human worker. Each invention, each improvement, displaces skilled and unskilled labour alike. Specialisation completes the cheapening of labour, efficiency goes with economy of labour, at the expense of the worker and his class. Thus, while the value of production steadily increases, the comparative need of labour as steadily diminishes, and unemployment increases singularly with increase of capacity to produce.

Both skilled and unskilled, intelligent and highly intelligent labour, becomes more and more at a discount.

THE IDEAL FORM OF APPRENTICESHIP CAN ONLY EXIST, WITH HAND AND BRAIN WORK, WHERE SKILL COUNTS; AND ACCURACY IS POSSIBLE ONLY WITH SUFFICIENT TIME ALLOWED FOR EACH TASK.

Inventions multiply so rapidly that a period of ten years brings about revolutions in method and output, rendering the skill acquired of less value, in some cases rendering the toiler of only unskilled value to the employer.

Apprenticeship on a commercial basis appears to be next to impossible. The law of self-preservation acts sordidly against the beginner and learner; highly-skilled workers have to guard jealously their own working and living interests. Then, too, there is little to learn with specialisation. A part—and a very small part—is played by each operative. Sometimes a few days, a few weeks, at most a few months, serve to make the learner competent for the particular work.

Only in cases where management is in view can an apprenticeship in the various branches of any given trade serve a special purpose. During the last depression in trade, 30 per cent., and even 50 per cent., of skilled workmen were on the unemployed list.

From a practical standpoint, the absorption of this number is imperative before any serious attention can be given to beginners. While, on the one hand, the trained and skilled workers are capable of carrying on the whole of our trade, on the other hand, until the unemployed are brought down to a 3 per cent. ratio, apprenticeship has little chance of succeeding.

While the sordid haste and economy of production exacts more and more output, for ever lessening wages and labour, the apprentice stands no chance. Youths who display extraordinary intelligence and deftness of hand in technical schools and classes, producing beautiful work, are always allowed ample time and afforded painstaking supervision. While the article produced without hurry displays the latent skill of the beginner, it is an entirely different experiment when time and labour become commercial assets.

So co-ordinated is the organisation of industry in any given trade that individual skill and character become

almost a negligible quantity. The artistic and intellectual qualities of apprenticeship could be utilised IF TECHNICAL TRAINING FORMED PART AND PARCEL OF OUR EDUCATIONAL SYSTEM.

Theory instruction might be given upon all practical matters of engineering and machinery generally. A youth might start the drudgery of his working life with some comprehension of the co-ordinated parts of any given industry, and he might more intelligently apply his faculties and physical powers to the particular section he is directly concerned with.

This task should be undertaken by the State. Neither employers nor private organisations appear capable of dealing with this important matter. The sordid stress of competition, the necessity of economy in labour-saving as well as wage-saving, compels each employer to look after his own interests.

The English employer, being particularly dour and individualistic, is least likely to organise any class, committee, or conference at a works for the purpose of consulting or making suggestions for improvement of inventions—things which the Germans and Americans have very well exploited. Such a short-sighted policy makes a management stereotyped, and the worker a mere drudge—which means, in both cases, mental atrophy and consequent incompetence.

The apprenticeship system, poorly supported by employers, will die a natural death. The only substitute at present appears to be State technical schools and classes for youths up to the age of eighteen, finishing the last three years (up to the age of twenty-one) in the workshop of any given industry, the youth to receive wages, and his progress to be supervised by a State technical adviser to ensure competence in training.

The real factors against apprenticeship appear to me to be:—

(*a*) The stress and hurry of competition, together with the wonderful growth of skill and invention, aided by closer organisation and economy, encourage neglect of both skill and art in any given industry.

(*b*) The lessened value of brain and handcraft in productive processes reduces individual efficiency to a vanishing point, and therefore offers little or no encouragement to an apprenticeship system.

(*c*) Specialisation so imperative to success in modern industry displaces personal ability and skill, making the worker a drudge to a special and small process of manufacture.

(*d*) The State must attach to the ordinary school-teaching industrial classes for technical instruction, as well as opportunities for obtaining practical experience in any trade or calling, allowing certificated employers of repute such apprentices to finish their training under proper inspection.

Under capitalistic production the pace is too fast. The work is done in such clumsy and narrow ruts that a state of ideal art, craft, and individual competence seems next to impossible. The great advantage to the nation of well-trained youths is, that we should possess such potentiality of skill and discipline, with personal worth, as to provide a reserve army of educated minds fit for developments beyond our dreams of ambition and pride. WE CAN SAVE OUR COUNTRY FROM DECAY BY SAVING OUR YOUTHS FROM INCOMPETENCE.

THE LONDON COUNTY COUNCIL'S PRACTICAL RECOMMENDATIONS.

On this important matter our leading Education Authority recommends—

"That the age of compulsory attendance at elementary schools should be raised from fourteen to fifteen.

"That pupils should then attend, up to the age of eighteen, a 'half-time' school, where they would receive a practical all-round training in the trade to which they have been apprenticed.

"Educational authorities should be empowered to compel employers to allow their apprentices and learners 'time off' during the day to attend classes, and to enforce such attendance on apprentices and learners. At least half the working-day should be spent in the schools."

So far this is distinctly progressive, but it will take some time to accomplish even in London; and when it has been accomplished under each Authority in the country, there will still be a serious gap.

We think that the *Practical Teacher* can, with the help of its readers, do something towards filling this gap, and we propose to unfold our plan next month.

NEXT MONTH

The Practical Teacher will contain a descriptive illustrated article on the forthcoming

EXHIBITION OF APPRENTICE WORK

to be held in London at an early date.

The New Constructive Movement.

SUGGESTIONS FROM AMERICAN SCHOOLS.

BY W. H. WINCH, M.A.

PERHAPS I may fitly add a few words of comment on the American syllabus of constructive work which I gave in the issue of February. With the exception of the needlework, it is common in English schools to find no continuation of the infants' school constructive work in the lower standards of the senior departments. The American syllabus shows an *attempt to continue the manual work of the ideal infants' school.* I use the expression italicised just as it was given to me by a teacher in a girls' department who was kind enough to read these syllabuses for me. I rather fancy she meant to imply that all infants' departments were not necessarily included — they do not all, perhaps, supply a basis of constructive work on which to build.

Then another point of distinction from most of our own work is at once evident. The children are set to make things which are probably pleasing to themselves, and which may appear to have some sort of immediate use. For my part, I believe that we in England underwork this principle of the gratification of immediate interest; we do not rest upon it even in cases in which we might most legitimately do so. For if progress in the desired direction can be attained by means wholly pleasant and agreeably stimulating, it seems sheer fatuity not to adopt these means. It is not uncommon amongst uncultivated people to find an abiding conviction that the nastier the medicine the more good it does. A similar view is still very prevalent in educational theory and practice. But I do not wish to go too far, and drop into what is called "soft pedagogy." We may find that exercises relatively uninteresting in themselves, and which we do not want to do for their own sakes, are, notwithstanding, necessary to enable us to carry out efficiently the things we want to do.

Children will take much spontaneous interest in practical arithmetic; they will take much spontaneous interest in learning their tables, but, with some exceptions, not so much. What are we to do? Are we to let the tables go by default? I hardly think so. I should suppose, rather, that we point out the uselessness of our practical arithmetic, unless the results are right. We need not invent drudgeries, but we shall find some of them awaiting us here and there all along the educational line.

Let me now apply this principle to the case of manual training. The child likes making things—some things, that is. He must be accurate enough to make the thing —that is, he must judge his distances and his movements, so that the things will come fairly well up to the standard which, in a vague way, he sets before himself.

Psychologically, most of us when we were children, except in school, proceeded in that way. One thing was equal to another when for our practical purposes it was just as good. Other things did not exist as far as we were concerned. By the way, we still say, "That's nothing," if some one tells us of a thing—say a comet—in which we are not interested. Such was the beginning of our endeavours towards adjustment and accuracy. Can we "jump this stage" in education? The American syllabus appears to be drawn up by persons who do not think so.

But though I am of the opinion that we cannot "jump the stage," I do not think that we can permit children for ever to remain in it. And I take it that it is "right here"—as an American would say—that our English methods are superior. The same critic who spoke about the ideal infants' school said: "Where do these American models and occupations lead? Are not the girls and boys going to do different kinds of manual work when they grow up? Should there not be, therefore, as soon as may be found educationally profitable, some difference in syllabus due to this difference of aim?" Of course we can easily answer such questions by vague words about training the child's hands and eyes. We can say that we will take the exercises most valuable for training with both sexes, whatever their future work may be. But modern psychology has turned the flank of all such arguments as these. It seems doubtful how far there can be any training in general dexterity at all. It must be, some assert, training for a particular end in view. I am not entirely of this opinion. I am trying to plan out some experimental work to help to settle the question under dispute. But I am fairly sure that the transfer of dexterity from one occupation to another is very much less than used to be thought. It is probable, therefore, that we shall by-and-by give up the notion that there can be a general scheme or constructive syllabus which is properly preparatory to any and every sort of subsequent manual work. Hence we shall need variety, and it may be useful for us to consider some forms of constructive work which are not exactly those of the carpenter's bench.

Let me, as usual, proceed by object-lesson methods showing what was done in

A NEW YORK VACATION SCHOOL.

A Class in Leather and Burnt-wood Work.—Eighteen boys, from ten to fourteen years of age, ranging from Grade III. to Grade VIII., were present in the class.

The tools in use on this occasion were small nut-picks and foot-rules. Six pairs of nut-picks were allowed, and a much larger number of rulers, but some of the boys were using their own.

The leather supplied was in sheet cowhide, and appeared to be of extremely good quality.

All the boys were making a whisk-broom holder. The pieces of leather with which the boys were working had been cut by the teacher into the general shape required. Each boy had, however, drawn his own design. The best is reproduced below in a scale of one-third. It was done as part of the ordinary class-work. It was not examination work, nor was it polished up for a visitor to see.

The design is placed over the leather and traced through. The lines are deepened, and then the punch is used afterwards to fill in the background.

At least theoretically, the points of view now adopted by the best educational opinion—namely, that *design* must have relevance to something with a purpose and to the material of which the thing is to be made—are accepted in this exercise.

But I do not think English teachers would have been satisfied with the execution of the work. The teacher himself complained that only one boy here and there could draw—a complaint which I thought fully justified by a careful inspection of the papers. And why, oh why, decorate the object with its name? It is useful sometimes for inspectors and teachers for boys to put the names on the maps they draw—they do it quite kindly and spontaneously. And perhaps, after all, we should not know (without the name) that the thing *was* a holder for a whisk-broom.

(*To be continued.*)

THE CONSTRUCTIVE MOVEMENT IN CANADA.

ONTARIO'S PROGRESS IN ELEMENTARY TECHNICAL EDUCATION.

BY ALBERT H. LEAKE, INSPECTOR OF TECHNICAL EDUCATION, TORONTO.

THE one engrossing topic of educational discussion to-day is "technical education." The masses plead for it, the manufacturers demand it, and the educationist advises it. Much has been written, more spoken, and of the making of books there is no end. Notwithstanding this profusion of matter on the subject, and the attention that has been given to its development, there is one phase that has received but scant attention, and that is its place in elementary education.

If manual training, household science, agriculture and horticulture, and the industrial arts are to have any influence on the progress and growth of a country, it is in the elementary school that this influence will have to be exerted. Manual training has been introduced fairly generally into the schools of the cities and larger towns, but the schools of the smaller towns and villages have been neglected.

In this province of Ontario we have rural, urban, and city schools; and now that the city schools have been provided for, every encouragement is being given to the introduction of the elementary industrial arts into the urban and rural schools. Here, as always, the main difficulty has been the supply of properly trained teachers, and this year a serious attempt has been made to supply this deficiency.

For the past six years every normal student has received a certain amount of instruction in elementary manual training, constructive work, or handwork, as it has been variously called; but it was felt that this was not sufficient for the purpose intended. Arrangements were therefore made by the Education Department for the instruction of teachers in elementary agriculture and horticulture and the elementary industrial arts at the Ontario Agricultural College, Guelph.

The courses are open to teachers in training at the normal schools who pass the April examinations for second-class certificates, and fulfil the other conditions prescribed by the Department of Education. The course in elementary agriculture is intended primarily for rural school teachers; that in elementary industrial arts for teachers in graded urban schools. Students are not permitted to take both courses or parts of each course. The term is ten weeks. No fees are charged, and the Department pays the travelling expenses of the teachers-in-training to and from their homes, and board and lodging are also provided free. The applicants for the course are required to pledge themselves to three years' service in teaching in Ontario schools.

This scheme was put into operation in April last, and in accordance with it forty teachers have been awarded certificates in elementary industrial arts to the effect that they are competent to give instruction in this branch in addition to the ordinary school subjects. A corresponding certificate has been awarded to one hundred teachers in elementary agriculture and horticulture. The object of the course is to provide a body of teachers for organising and carrying on elementary industrial training in the schools of the province, which are unable to provide well-equipped Manual Training Departments.

In the working out of the course great stress was laid on drawing. "Every workman should, for the most part, be able to conceive clearly and accurately in his own mind the shape of everything he may have to make or work with. This makes it the first condition of skill that he should master shape in his own mind, and that mastery requires him to be a geometer." The examples and exercises selected for working during the course illustrated general principles, and, it is hoped, will lay sufficient foundation for working out practical courses in the different schools of the province. It should be understood that the standing of a specialist in manual training cannot be obtained in this course, but the work done during the session will be counted *pro tanto*. The Ontario Agricultural College (O.A.C.) has a well-equipped Manual Training Department in what is known as Machinery Hall, and contains class-rooms, drafting-rooms, rooms for wood-working and metal-working, and all necessary tools and appliances.

APPLIED MANUAL TRAINING.

Visits were made to local schools to study equipment, organisation, and methods, while all the local industries were carefully examined in order to see how the instruction given could be rendered applicable. The school was in session six hours a day, but the majority of the students worked every available minute, and were in no sense governed by the clock.

The course of study was as follows :—

PEDAGOGICS.

(15 hours.)

(*a*) Manual training as a factor in general education; (*b*) Sketch of the various systems—Russian, Swedish, Sloyd, etc.; (*c*) Progress of manual training in Canada; (*d*) Methods of teaching, plans of courses and lessons, organisation, equipment, plans, estimates of cost, etc.; (*e*) Lectures dealing with industrial questions and the means of improving our opportunities; (*f*) Visits to local industries, and consideration of industrial development in Canada.

DRAWING, APPLIED ART AND DESIGN.

(120 hours.)

Emphasis will be laid on the practical application of drawing to the industries.

Drawing: (*a*) The use of squares, triangles, and instruments; (*b*) Plane geometry, practical problems, lines, angles, and polygons; (*c*) Construction and use of plain scales; (*d*) Orthographic projections of solids—three or more views; (*e*) Cutting and oblique planes and sections; (*f*) Isometric projection; (*g*) Working drawing; (*h*) Machine drawing; (*i*) Tracing—blue printing.

Applied Art and Design: Observation of these in local manufactures and in common decorated objects, such as wall paper, carpets, furniture, cloths, jewellery, iron and brasswork; practical applications in everything undertaken in the constructive work.

WOOD WORKING.

(100 hours.)

(*a*) Bench exercises in making articles requiring joints, mortises, fastenings with dowels, pins, cleats, keys, wedges, glue, screws and nails, etc.; (*b*) Calculation of the quantity of lumber necessary for making the articles and estimation of cost; (*c*) Tools (5 lessons), their construction, care, use, and sharpening; (*d*) Analysis of the action of cutting tools, cutting angles, etc.

Finishing (2 lessons): (*a*) Staining, fuming, filling, shellacing; (*b*) Oil and wax polishing; (*c*) Pigments, priming, coats; (*d*) Oils, driers, brushes; (*e*) Painting and glazing.

Forestry and Lumber (4 lessons): (*a*) Forest preservation—propagation, time of cutting, pruning; (*b*) Trees—classes, structure, growth, seasoning, shrinking, and warping; (*c*) Properties of woods—durability, elasticity, stiffness, density; (*d*) Varieties of common woods—peculiarities of each, colour, grain, identification; (*e*) Defects in lumber—resin pockets, knots, shakes; (*f*) Decay and its causes—preservation; (*g*) Lumbering—transportation, sawmills, grading widths.

CONSTRUCTIVE WORK.

(65 hours.)

(*a*) Cardboard work—thin and thick boards (20 hours); (*b*) Modelling—clay, sand, and papier-mâché (10 hours); (*c*) Simple bookbinding (10 hours); (*d*) Simple metal work (15 hours); (*e*) Knife work such as can be carried on in the ordinary classroom at the school desk (10 hours).

A reference library was provided. This consisted of several copies of each of the following books :—*

THEORY.

Theory of Educational Sloyd, Salomon (Philip and Son, London. $1.25).

* The Editor will be glad to advise readers who have any difficulty in obtaining these publications.

IN BASEMENT OF RURAL SCHOOL.

School and Society, Dewey (University Press, Chicago. $1.00).
Education and the Larger Life, Henderson (Houghton Miffin and Co. $1.30).
The Place of Industries in Elementary Education, Dopp (University Press, Chicago. $1.00).
Economics of Manual Training, Rouillion (N. W. Henley Publishing Co. $2.00).
Manual Training made Serviceable to the School, Goetz (Newman, London).

DRAWING.

Bases of Design, Walter Crane (Bell and Sons, London. 6s.).
Line and Form, Walter Crane (Bell and Sons, London. 6s.).
Classroom Practice in Design, J. P. Haney (Manual Arts Press, Peoria, Ill. 50c.).
Principles of Design, Batchelder (Inland Printer Co., Chicago. $3.00).
Machine Drawing and Design, D. A. Low (Longmans, Green, and Co. 2s. 6d.).
Plane and Solid Geometry (George Gill, London, England. 50c.).
Mechanical Drawing, Anthony (D. C. Heath and Co., Boston).

WOOD-WORKING.

Educational Wood-working, J. C. Park (The Macmillan Co. $1.00).
Elementary Sloyd and Whittling, Larson. (75c.)
Essentials of Wood-working, Griffith (Manual Arts Press. $1.25).
Beginning Woodwork, Van Deusen (Manual Arts Press. $1.00).
Problems in Wood-working, Murray (Manual Arts Press. 75c.).
Problems in Furniture Making, Crawshaw (Manual Arts Press, Peoria, Ill. $1.00).

FINISHING.

Polishes and Stains for Woods (Upcott Gill, London, England. 25c.).
Natural Woods, and How to Finish Them (Berry Bros., Detroit. Free).

LUMBER.

Primer of Forestry, Pinchot (U.S. Department of Agriculture. 35c.).
Timber, Hasluck (Cassell and Co., London, England).
First Book of Forestry, Rothe (Ginn and Co., Boston, $1.25).
Our Native Trees, Keeler (Publishers' Syndicate, Toronto. $2.50).

CONSTRUCTIVE WORK.

Seat Work and Industrial Occupations, Gilman I. Williams (The Macmillan Co. 50c.).
Correlated Handwork (Trybom and Heller, Detroit. $1.25).
Cardboard Construction, Trybom (Milton Bradley. $1.00).
Paper and Cardboard Construction, A. H. Chamberlain (Whitaker Ray. 75c.).
Story Telling with the Scissors, M. H. Beckwith (Milton Bradley, Springfield, Mass. 50c.).
Practical and Artistic Basketry, L. R. Bradley (E. L. Kellog and Co. $1.00).
Occupations for Little Fingers, Sage and Cooley (Scribner and Co. $1.00).
Hand-Loom Weaving, M. P. Todd (Rand M'Nally and Co. 90c.).
Clay Modelling, Holland (Ginn and Co. 75c.).
Clay Modelling, Unwin (Longmans and Co. $1.00).
Copper Work, Rose (The Davis Press, Worcester, Mass. $1.50).

(To be continued.)

A NEW COURSE OF PRACTICAL AND CONSTRUCTIVE WORK,

ARISING OUT OF AND COMBINED WITH THE ORDINARY SCHOOL SUBJECTS.

For Junior, Middle, and Upper Divisions of Primary Schools.

BY A. R. PICKLES, M.A., AND DALTON GRANGE.

NOTE.—In order that the child's book may present a complete course, the copies of lines, diagrams, etc., reproduced by the teacher in sufficient number to supply one to each pupil, should be pasted in the child's drawing-book. Stickphast or gloy is best for little children. The pasting and arranging are in themselves constructive in character, and the building up of a good, well-arranged, well-worked book is a useful training.

JUNIOR COURSE.

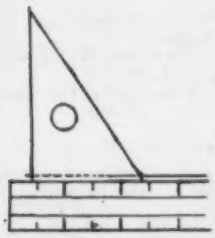
LESSON 5.—THE SET-SQUARE.

1. Place the cube on the drawing-book. Hold firmly with the left hand, and with a lead pencil draw round the base of the cube. Direct attention to the poor corners, and show the need for some other way of drawing the figure.

2. Provide each pupil with a set-square. Give the name "set-square." Write on blackboard. Place the set-square on the drawing-book, hold firmly with the left hand, and draw round its edges with the lead pencil. How many sides has the set-square? Corners? Write in your book the number of sides and corners the set-square has.

3. Now give each pupil a pair of scissors and a piece of the binding used in cardboard modelling, or a piece of string. Cut off a piece as long as one of the sides of the set-square. Place this piece on the drawing-book on the line of equal length. Repeat with a second side of the set-square, and then with a third side. Pick up the three pieces, and compare their lengths. Which is the longest piece? the shortest piece? Now write on these sides in your book, "Longest side," "Shortest side."

4. Draw attention to the corner which is opposite the longest side. Place a corner of the cube on this corner. Repeat with other corners of the cube. Place this same corner of the set-square on each of the corners of the figure (square) at the top of the page. Repeat with other drawings in the book. Give the name "right angle" to this corner of the set-square. What is this corner of the cube? drawing? Show postcard, envelope, exercise book, etc., for right angles. Point out a right angle in the room. Point out other right angles, and show that they are such.



5. Place the bottom edge of your ruler against the bottom of the page of your book, and draw a line 3 inches long, beginning close to the left-hand side of the book. Put the set-square on the ruler, with the right angle at the left-hand side of this line (see diagram). Hold the set-square firmly, and draw a line along the edge of the set-square from the end of the first line. Make this line 4 inches long. Join the free ends of these lines. Measure and write down the length of this line. What do you know about the corner opposite this line? Test the right angle. What is the sum of these three lines? Write down the sum of the shortest and longest line. Take away from this the length of the remaining line. Measure from the bottom right-hand corner 6 cm. along the longest line, and place a dot. Place the right angle of the set-square at this dot, so that the edge of the set-square is on the longest line. Draw as before, making the line 8 cm. long. Join the top of this line to the right-hand end of the line at the bottom of the page. What is the length of this line? What is the sum of the last two lines that you have drawn? Mark the right angle by means of a letter X. Give the name "perpendicular" to each of the lines which make the right angle. Write on the blackboard. Which of the sides of the set-square are perpendicular? Point out some perpendicular lines in the room. Show why each line is perpendicular.

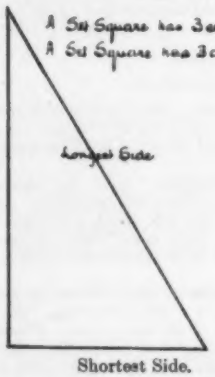
6. Provide numerous exercises in the drawing of right angles and perpendicular lines, preferably on separate sheets of paper.

EXERCISES.

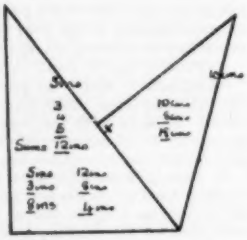
1. How many right angles on one of the faces of a cube?
2. On all the faces?
3. How many of the edges are perpendicular?
4. The picture on the wall is hanging crooked: are any sides perpendicular? Why?
5. Draw a line 5 cm. long. At each end draw a line 6 cm. long at right angles. How many right angles here? Perpendicular lines?

How the Pupil's Page could be Arranged.

1. 4
2. 24
3. 12
4. Yes.
5. 2
   3



Shortest Side.



LESSON 6.—THE CONSTRUCTION OF A SQUARE.

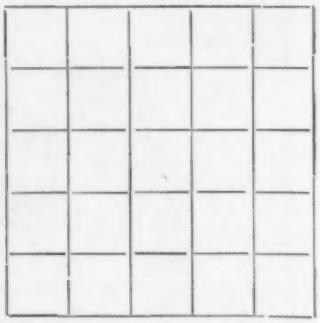
1. Provide each pupil with sheets of loose paper on which to practise the construction of the square. Draw a 4-inch line. (Whether this line is horizontal or not does not matter.) Keep the ruler to the line. At the left-hand end of the line draw a right angle. Slide the set-square or the ruler to the right-hand end of the line, and make another line perpendicular to the first. Make each of these lines 4 inches. What is the total length of the three lines drawn? Now join the free ends of the two lines drawn last. Measure, and write down the length of this line. What is the total length of all the lines?

2. Repeat, making squares having sides of 2 inches, 3 inches, 5 inches, 4 cm., 5 cm., 6 cm., 7 cm., 8 cm. After sufficient practice, draw a 2-inch square in the book.

3. Place the cube on the 2-inch square, so that it fits exactly. What is this face of the cube equal to? Repeat with other faces of the cube. Now write in your book what you have learnt about each of the faces of the cube.

4. Give each pupil a pair of scissors and gummed coloured paper. On the gummed side draw a 4-inch square. Cut out and paste in the book. How many sides has this square? What do you know about each of the sides? About each of the angles? Write this in your book. What is the distance round this piece of coloured paper? (Give the name perimeter.) Write down: "The perimeter of the square is 16 inches.

5. Draw a 5-inch square on the gummed side of the coloured paper. Divide each side into inches. Join the points on opposite sides by straight lines. Cut along the lines in one direction so as to get five strips. What is the length of the long side of one of these strips? Both the long sides? How many long sides in all the five strips? What is the length of all the long sides? How far is it round one of the strips? Cut each strip along the pencil lines into squares. How many squares are there? What is the perimeter of one square? two squares? three squares? etc.



(*a*) Take four pieces and arrange so as to form a square. What is the length of one side? Write down its perimeter.

(*b*) Draw a line 5 inches long. Place one of these squares on this line so that two opposite corners each lie on the line. Put another square on the line in the same way, touching the first one. Then another. How many sides have these squares altogether?

(*c*) Using the small squares, construct a square having a side of 3 inches. How many squares have you used? What is the perimeter of this square?

(*d*) Draw a 3-inch line. Place two of the squares on it close together, so that the opposite corners of each square are on the line. To the bottom corner of the first square place a corner of the third square so that the sides of the first square are in a line with the sides of the third square. Put square 4 under square 2 in a similar manner. What is the part in the centre that is not covered? How do you know it is a square?

(*e*) Fix one of the remaining squares in the book. Then place one square against each of its sides. How far is it round the outside edges of these squares? How many more squares are required to make it a complete square?

How the Pupil's Page could be Arranged.

Each face of a cube is a square.

The 4 sides are equal.
The 4 angles are right angles.
The perimeter of the square is 16 in.

(*a*),

2 in.
8 in.

(*b*)

12 sides.

(*c*)

9
12
in.

(*d*)

(*e*)

12
4
in.

Lesson 7.—Exercises on the Square—Inches and Centimetres.

1. Draw a square of 6 cm. side on the gummed side of some green paper, and one of 8 cm. side on the gummed side of some pink paper. Cut out, fixing the pink square in the drawing-book. Measure 1 cm. along the bottom of the square from the left-hand corner. Gum the green square with one side along the bottom of the pink square, and 1 cm. from its left-hand side.

Some Questions.

(*a*) How far is the green square from the right-hand side of the pink square ?

(*b*) Measure the distance between the top of the pink square and the top of the green square.

(*c*) Write down half the perimeter of the larger square.

(*d*) How much longer than 20 cm. is the perimeter of the smaller square ?

(*e*) What is the distance from the left-hand side of the green square to the right-hand side of the pink square ?

(*f*) How much of the edge of the pink square is covered by the green square ?

(*g*) What length of the perimeter of the pink square remains ?

(*h*) How much of the edge of the green square is inside the pink square ?

(*i*) Take this from the perimeter of the larger square.

(*j*) How much longer are three edges of the larger square than three edges of the smaller square ?

2. On the gummed side of a piece of brown paper draw a 3-inch square. Divide each side into inches. Draw lines across so as to divide the square into small inch squares. Cut out these squares.

Fix one of the squares in the drawing-book. At each of the top corners place another square having the bottom edge in the same line as its top edge. Repeat at its bottom corners.

(*a*) How many squares are needed to fill up the spaces ?

(*b*) What would be the perimeter of the square if the spaces were filled up ?

(*c*) How much of the perimeter of the square is missing now ?

(*d*) What is the perimeter of the five squares in the design ?

(*e*) What is the perimeter of the missing squares ?

3. Draw a 3-inch line. Place two of the remaining squares, with their opposite corners on the line, the squares just touching. Place the two remaining squares as shown.

(*a*) Measure in cms. the distance from A to B.

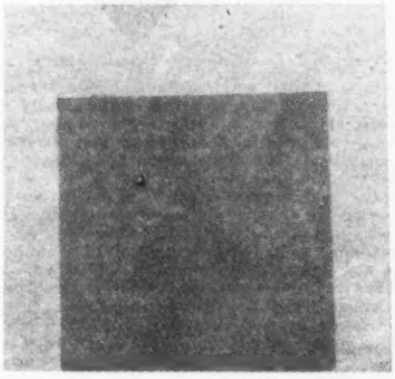
(*b*) Measure in cms. the distance from B to C.

(*c*) What is the length in cms. from D to E ?

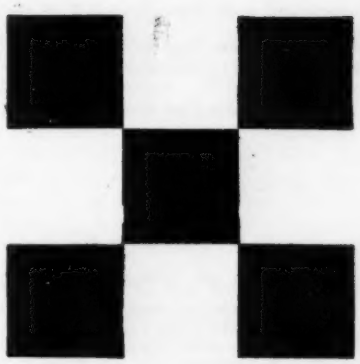
(*d*) What is the perimeter of one square in cms. ?

(*e*) What is the perimeter of all the four squares in cms. ?

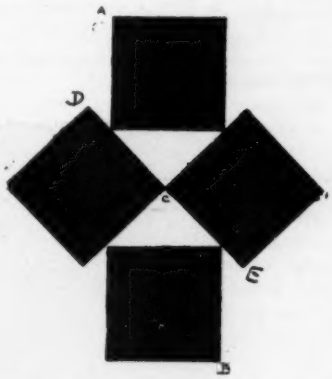
How the Pupil's Page could be Arranged.



(*a*) 1 cm.
(*b*) 2 cm.
(*c*) 16 cm.
(*d*) 4 cm.
(*e*) 7 cm.
(*f*) 6 cm.
(*g*) 26 cm.
(*h*) 18 cm.
(*i*) 14 cm.
(*j*) 6 cm.



(*a*) 4 in. (*b*) 12 in. (*c*) 4 in. (*d*) 20 in. (*e*) 16 in.



(*a*) 8 cm. (*b*) 4 cm. (*c*) 5 cm. (*d*) 10 cm. (*e*) 40 cm.

Lesson 8.—The Half-Inch.

1. Give out rulers, scissors, and to each pupil one piece of the binding that is used in cardboard modelling, or a length of string. Cut off a piece 7 inches long. Fold in two equal portions. Cut, and place the two pieces side by side on the desk. Cut from each a piece 3 inches long. Place the two longer pieces end to end. What is their total length ? What must be the total length of the two shorter pieces ? Place them on the ruler so as to prove that their total length is 1 inch. One penny equals two ——— ? One inch equals two ——— ? Place a long piece and a short piece end to end. What is their total length ? What is the length of the remaining pieces ? What is the half of 7 inches ? Draw a line in your book 3½ inches long.

2. Repeat, with length of binding, 3 inches, 5 inches, 9 inches.

3. Provide practice in the measurement of half-inches, as shown in Lessons 2, 3, and 4, and in dividing lines into half-inches.

Some Exercises, introducing the Half-Inch.

[*N.B.*—In the following exercises, after the answer has been found by actual measurement, the sum will be written down: 3½ in. + ½ in. = 4 in.]

(Insist on actual measurement.)

1. Draw a line 3½ inches long. Place your ruler on the line and add ½ inch. Measure the new line, and write down its length.

2. Repeat, with lines 1½ inches, 2½ inches, 4½ inches long.

3. Draw a line 2½ inches long. Add to the end another line 1½ inches long. What is the length of the new line ?

4. Repeat with lines 3½ inches, 4½ inches, 5½ inches long.

5 Add to a line 2½ inches long another line 3½ inches long. What is their total length ?

6. Place two lines, each 3½ inches long, end to end. Write down the total length.

7. Measure 5½ inches from one end of this line, and put a dot. How far is the dot from the other end of the line ?

8. What would be the length of four lines, each 1½ inches long ?

9. Draw a dotted line 7 inches long. Make 2½ inches of this.

thick. Measure, and write down the length of the dotted line that remains.

10. From a line 5 inches long cut off a part $3\frac{1}{2}$ inches long. What is the length of the remaining portion ?

How the Pupil's Page could be Arranged.

1. ——————————————————— 4 in.

$3\frac{1}{2}$ in. + $\frac{1}{2}$ in. = 4 in.

3. ——————————————————— $2\frac{1}{2}$ in. + $1\frac{1}{2}$ in. = 4 in.

EXERCISE ON THE SQUARE, INTRODUCING THE HALF-INCH.

On the gummed side of a piece of coloured paper draw a 5-inch square. Mark the middle point of each side. Join as in diagram.

SOME QUESTIONS.

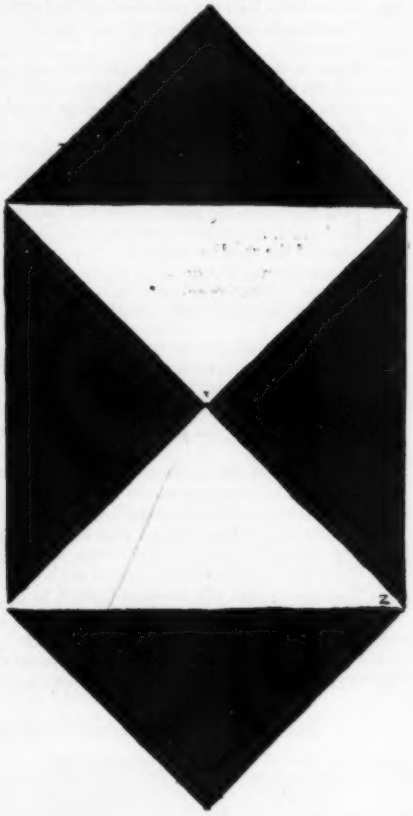
1. What is the length of one of these lines ?
2. What is their total length ?
3. What is the perimeter of the 5-inch square ?
4. How much longer is it than the total length of the four lines just drawn ?

5. Draw a line equal to the side of the square. Cut off a part equal to one of the lines just drawn. Mark the length of each part of the line. Cut off the corners of the square. Take the large piece and measure its sides. Place the set-square on its corners. What is it ? Why is it a square ? Arrange the square and the corners in the drawing-book as shown below.

6. Measure, and write down the length of each side of one of the corner pieces.
7. What is the distance round one of these pieces ?
8. Measure, and write down the distance from X to Y.
9. Measure, and write down in cms. the distance from X to Z.
10. Draw a line from one corner to the opposite corner of the square, and measure its length.

(Introduce here the term "diagonal.")

How the Pupil's Page could be Arranged.



1. $3\frac{1}{2}$ in.
2. 14 in.
3. 20 in.
4. 6 in.
5. ——————————— $3\frac{1}{2}$ in. | $1\frac{1}{2}$ in.
6. $3\frac{1}{2}$″ $2\frac{1}{2}$″ $2\frac{1}{2}$″
7. $8\frac{1}{2}$ in.
8. $3\frac{1}{2}$ in.
9. 14 cm.
10. 5 in.

RETIREMENT OF MISS M. H. MASON.

THE Local Government Board is about to lose by retirement the valuable services of Miss M. H. Mason, who, since 1885, has been Inspector of Children boarded out under the Poor Law. The event is of exceptional interest from the fact that she is the actual pioneer of the whole system of official inspection carried out by women on behalf of their own sex. Twenty-five years ago she represented an experiment. Mrs. Nassau Senior had been for a brief term in the 'seventies an inspector of Poor Law Schools, but the strain had been more than she could bear, and nearly ten years were to elapse before Miss Mason was to be asked to become the first lady ever appointed under Government to a post of such high responsibility. How she has fulfilled her trust is perhaps best answered by the readiness of the other departments to follow the precedent thus created. The Home Office was the first to do so, and at this moment it has a principal lady inspector, six senior lady inspectors, ten lady inspectors, and a staff of fifty-two assistants. At the Board of Trade there is now a department composed of ladies in connection with questions of women's labour, and the Board of Education has its staff of ladies to inspect and advise on girls' education.

A great love of little children induced Miss Mason to take up the work, for she came of a well-known county family in Nottinghamshire, and had both served on a voluntary committee in that county and seen for herself in the villages the need for bettered conditions. When she assumed the duties, many of the earlier committees had either dissolved or had become somewhat lax, and she had much to discover for herself in order to bring her schemes into orderly working. It is not, perhaps, always realised by those not actively concerned with Poor Law administration that children boarded out within the area dealt with by their own union are officially treated on a different basis to those sent outside it. The former are under the inspection of guardians nominated by their fellows for the task, or, as sometimes happens, the relieving officer. The latter were Miss Mason's special charge. In numbers they varied slightly, and were generally somewhere about 2,000—in 1908, for instance, there were 1,876—but they were scattered all over the country, involving an immense amount of travelling. Up to 1898 she performed this vast work single-handed, but as she became more and more consulted by the London Boards of Guardians as to suitable places to which to send children, and the duties tended to increase, two assistant-inspectors were then appointed.

SPANNING THE GULF;

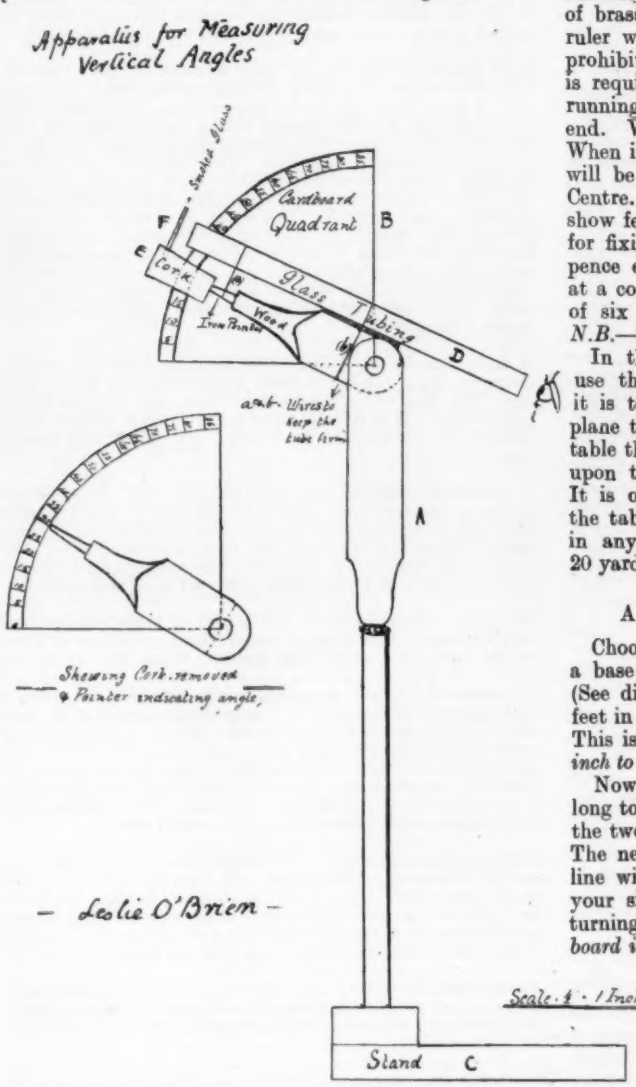
OR, KINDERGARTEN INSTRUCTION FOR THE UPPER STANDARDS.

BY H. G. STYLES.

(*Continued from page 428.*)

APPARATUS A2.

I SUGGEST that two patterns be adopted—one in wood, the other in cardboard. The former must be made at the Manual Centre; the latter is suitable for the class-room, and forms a splendid exercise for the practical arithmetic and mechanical drawing lessons.



I think the diagrams show very clearly what the apparatus is like, so that it will only be necessary for me to refer to one or two details. At the one end of the glass telescope (D) two pieces of fine black cotton are fixed with seccotine, thus ⊕; at the other end a piece of stout paper, in which is a pin-hole to look through ⊙. When taking the altitude of the sun the cork and smoked glass is fixed on the iron pointer, and then removed to read the angle. With this apparatus the altitude of the sun has been taken *three times* a day—namely, 9 a.m., noon, and 3 p.m.—whenever possible, and, after comparing with official tables, have been found correct to within 3° to 5°. I shall give an exact reproduction from a pupil's daily records showing this at a later date.

Now, as it is very desirable that the pupils should practise with the plane table in the classroom or playground before using it in the field, I will just refer to two other accessories, and then give a typical example showing clearly how to use it. A sighted ruler made of brass is sold by P. Harris, but the ordinary school ruler will answer the purpose where the price proves prohibitive—a general condition, I assume. All that is required are two short black pins placed on a line running through the centre of the ruler—one at each end. We use gramophone needles for the purpose. When in the field about half a dozen rods six feet long will be required. These can be made at the Manual Centre. They should be painted black and white to show feet, and the lower end should have an iron shoe for fixing in the ground. The latter cost about fourpence each. Our lads made and painted six of these at a cost of about eightpence each. The price of a set of six is sixteen shillings—a saving of 75 per cent. *N.B.*—The six feet must *include* the iron shoe.

In the following exercise for plane table, when I use the expression "clamp the board immediately," it is to be understood that I am assuming a proper plane table is being used. With the home-made plane table the clamping is impossible, and one has to depend upon the tightness of the stud fitting in the board. It is of the very greatest importance, however, that the table be not moved after orienting it or fixing it in any position. In the playground a base line of 20 yards can be taken and the scale altered accordingly.

A FIRST EXERCISE WITH THE PLANE TABLE.

Choose a good-sized open space where you can fix a base line and two or three rods about 6 feet long. (See diagram.) Fix one rod at A; then measure 300 feet in a straight line, and mark it with a second rod B. This is your base line. A convenient scale will be *one inch to one hundred yards.*

Now fix the plane table at A, and draw a line 3 inches long towards the left side of paper and midway between the two opposite edges. Letter it as shown in diagram. The next thing is to bring this line on the paper into line with your two rods A and B. To do this, place your sighted ruler on AB and look along the sights, turning the board until you cover rod B. *Clamp the board immediately* you have fixed the position.

N.B.—You must be careful to get your board into position every time before you measure angles.

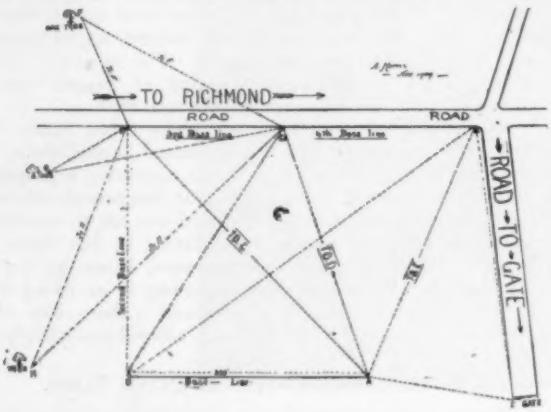
Now fix a pin into the board at A. This will enable you to keep your ruler on the point A without trouble. Let three boys take a rod each, and go forward in a direction which you will decide according to circumstances and available space. Signal to them when you wish them to stop, and let each fix his rod into the ground. In the plate these rods are marked C, D, E, and they are about 300 yards, 200 yards, and 150 yards from A respectively.

You are now ready to begin your survey.

From A sight carefully to C, D, and E. As you sight each rod, draw a line on the paper showing the direction, and mark it, "To C, To D, To E." Now go to the B end of your base line and perform a similar operation—first to C, then to D, and lastly to E. Where these lines intersect, the first set of lines is the point you wish to fix. Mark each accordingly.

You will, of course, have taken care to fix your board first, so that the base line on the paper is in line with the actual base line. As I stated before, this must be done each time before the directions are sighted, otherwise everything will be wrong. In the diagram these three rods are on the edge of a road, so that by joining them (see dotted line) you fix one side of the road at once.

Having considered which rod is most convenient to reach from your position at B (in this case C), you move forward and fix table as before at C. Here you use CB as a base line. Swing the board into position, so that you are on the line CB, and then take the direction of CH, CG, and CF. (*As a guide, remember that it is advisable to avoid lines intersecting at angles less than*



30°.) In this particular case F is an oak tree at the extremity of a wood, and G and H are other trees marking the boundary of the same wood. It would now be convenient to move towards D, where you would fix the board in a line with rods D and C, and then sight to F, G, H, thus fixing the position of F and G. Mark each point as before when fixed. Moving to E, you can then sight D or A, and so set your board into position; or, if you prefer it, the point A will do equally well. From E or D you sight the tree at extremity of wood (marked H) and the gate at I, which you can fix by sighting again from A, and so finish. It will be observed that this last line, AI, could have been sighted at first, when you started from A.

If you have any details to add, they can be put in now or later. For instance, you might fill up the space between F and H with trees, and mark it "Wood;" and the road could be also finished, if desired.

Let me here impress upon the teacher the need for very careful sighting. If the lads are fortunate enough to have brass rulers properly sighted, the difficulty is minimised. Failing this, it is extremely difficult to sight a 6-foot rod at 300 yards. You can test your work as you go along, by bringing the board to the proper bearings, and then trying to make your lines fit in with the direction from where you stand.

I may add that it is customary to have such rods as those referred to marked off in feet and painted red and white. I find that they can be sighted better if painted *white* and black.

PRACTICAL HOUSEWIFE HINTS.

BLACK-LEATHER BOOTS will last much longer if they are well rubbed with vaseline once a fortnight. This is especially good for children's boots. It was found an excellent plan in a large school.

DIRTY MARKS can be removed from a light-coloured wall-paper by rubbing very gently with finely powdered bath-brick and dusting with a clean duster.

PLAIN OAK PICTURE-FRAMES can be made like new if they are rubbed with fine sand-paper. It is best to rub one way only.

LACE WINDOW-CURTAINS are often a worry to the housewife; they are constantly needing washing or renewing. The best way to make them last a long time is to use flour starch. The curtains should be well washed, taking care to shake all loose dust from them before they are wetted, and running a lot of cold water through them first. They are now ready to be starched. Take two tablespoonfuls of flour and mix with cold water to a very smooth paste, then add sufficient boiling water to make a large bowlful. This starch must not be thick, as it is very stiff. Starch the curtains in the usual way, wringing carefully, then hang up to dry as straight as possible; when nearly dry, fold carefully. Do not stretch too much; mangle well, and the curtains will not need much ironing. Good curtains treated this way look just like new. The starch may be tinted if required.

A GOOD CEMENT can be made for mending household ware or china by using plaster of Paris mixed with the white of an egg. The plaster may be bought from any chemist by the pennyworth. It is best to make just a little at a time, as the cement will not keep for future use. The plaster will keep as long as it is dry.

A HARMLESS COSMETIC may be made from two ounces of pure glycerine and one ounce of tincture of myrrh, mixed together with two tablespoonfuls of warm water. If a little of the mixture is rubbed into the hands and face immediately after washing, taking care to dry well with the towel afterwards, this will be found most beneficial for going out in all weathers.

TO MAKE APPLE CHUTNEY, boil a pint of brown vinegar with half a pound of brown sugar, and a pound and a half of apples which have been cored and peeled. When the apples are reduced to a pulp, turn them out into a bowl. When cool, add a quarter of a pound of sultana raisins chopped, one ounce of salt, half an ounce of ground mustard seed, quarter of an ounce of ground ginger, a pinch of cayenne pepper, a single clove of garlic, with a little finely grated horse-radish. These latter should all be pounded together, then added to the apples, stirred well together daily for a week, then tied down in jar and covered up so as to exclude air. Keep in a cool place. This chutney keeps a long time, and is a very tasty relish to cold meat.

WHEN COOKING BEETROOT, if the nice round ones are not to be had, it is often a problem to the cook what to do with one that is too long for the pan. It is not generally known, but it is a fact, that if the beetroot is cut in two, or to the required size, and the cut end plunged at once into a red-hot fire until the end is quite burnt, this prevents it from bleeding while being cooked.

APPLE FRITTERS make a nice addition to a dish of grilled bacon for breakfast. Take a large apple and core with a three-pronged fork, then peel and cut the apple into rings, fry in the hot bacon fat until a light brown.

PARAFFIN OIL STOVES and lamps are a little out of date, but sometimes they are still the only things to be had. The most objectionable thing about them is the disagreeable smell and smoke they make. This can be avoided by adding a handful of salt to the oil. Make a paper funnel to run the salt into the oil. A small lamp will not need so much salt.

WHEN TEACUPS, or any other china articles, become discoloured with use, make a paste of salt and vinegar. Stains rubbed with this will soon disappear.

FAR AND NEAR.

INTERESTING ITEMS FROM VARIOUS SOURCES.

The "History" of Muriel Howard.

MURIEL HOWARD, aged fourteen, was educated in a secondary school which enjoys the advantage of financial aid both from the rates and from the State, as well as the privilege of State inspection. In this case, as will be seen, the result of the history lesson has been to produce an unbounded optimism and belief in human nature.

1. Hereward the Wake was a good ruler over a country. He was ruler over English people. He was born in the year 1076. He died in the year 1381.

Thomas à Becket was quite a little boy when he became king. He was a good little king. He was born in the year 1080, and he died in the year 1400.

Jack Cade was a good ruler and a good man. He was born in the year 1090, and he fought a great rebellion which was called Jack Cade's rebellion. He died in the year 1100, after many happy years.

2. The result of the Norman Conquest was very bad. The Normans won the English at a battle near Newbury. The battle was fought by the Normans in the year 1112.

3. The Magna Charta was a document which had to be signed by King John, which was called the Great Charter. It was signed by King John, because the Pope wanted King John to sign the document. It was passed in the year 1340. It was a great document. King John was a good king and a good man; he died in the year 1400.

The battle of Bosworth was won by the English against the Normans in the year 1420. It was fought on Bosworth Field. It was a great battle.

The Spanish Armada was a fleet of ships which set out for a sail on the water. The day was nice, fine, clear, and the water was calm and everything the sailors wanted.

4. The Petition of Right is a Bill passed by the king. The Bill consisted of different things, that every man and woman, boy or girl, should pay a tax of shilling raise for every boy or girl over fifteen years of age.

5. Mary Queen of Scots was a good queen, and also a good woman. She was a woman who had plenty of style. She was born in the year 1500, and she died in the year 1600.

6. The Gunpowder Plot was started by Guy Fawkes in the year 905 on the 5th of November. He begun by putting gunpowder in a hole and then lit it with a match. From that day till now the 5th of November has been called Bonfire Night, when people have set fireworks off on that night, and fires have been going in the open air.—*From Mr. Keatinge's "The Teaching of History."*

* * *

A Hint for next Summer.

LET me advise those who would seek a restful, unconventional holiday to devote a time to learning the language, then hie them away to a Russian village. It should not cost more than a holiday in England. Butter is fivepence a pound, eggs are five a penny, bread is cheap, vegetables and fruit are almost free, and even some kinds of meat are less dear than at home. I have paid only fourteen shillings a week for a room and four square meals per day, everything of the best, and the quantity unlimited. But he who would go must hasten his going, for such a state of things will not endure for ever. And if he fail to go, he may miss some very pleasant experiences. I have but to let my mind drift a little, and I am once more on a stout gray mare riding from village to village, saluted by hearty greetings from total strangers. There are no walls, no notices to trespassers, to hinder a gallop over the fields. On holidays—and there are many—the village plots are gay with brightly-dressed girls and red-shirted men dancing and playing at kiss-in-the-ring. On other days the same bright petticoats and red shirts are moving in and out amid the corn and hay. Within the cabins, a samovar steams for tea, a buckwheat pudding and some vegetable soup are cooking on the stove, rye-bread and butter are laid out on the table with fruit and eggs; for the labourer must not go hungry when he comes from the fields. There is enough to eat, the house is cosy, the man content. And to-morrow it will be the same; perchance, again to-morrow; and then, no more. For the peace and security in sufficiency, if not in riches, of the willing rural worker are doomed. Stolypin has spoken, the Government has approved, and ere long the most equitable land-system of Europe must die. With it perishes the happiness of ninety million peasants.—*Westminster Review.*

Reading for Pleasure and Profit.

THE following passages are taken from the *Reader's Review*, the organ of the National Home Reading Union:—

"The really important thing is that we should so develop our tastes that we can take pleasure in things which afford more than mere pleasure, which in one way or another open our sympathies, extend our interest in the world, or enlighten us on any essential thing under the sun. By studying philosophy we seek to understand the nature of all knowledge and its end; by reading poetry we seek to stimulate our perceptions and gain a clearer, instinctive insight into the common and uncommon mysteries of life; by reading fiction we attempt to put ourselves into touch with numberless phases of human nature. Literature is life on a broad scale. It is democratic. It cannot be exclusive, except in the sense that it excludes dilettantism, narrow-mindedness, and ignorance."—*R. A. Scott-James.*

"I know that the test of successful culture is not the sowing but the reaping; that the well-bred man is not he who has read most, but he who has read to most spiritual profit; and that the great book is not the book that is great to this or that critic, or even to this or that school of critics, but the book that is great to me, because it inspires me, though my failures may have been unto seventy times seven, to endeavour to live greatly.....Higher than all external authority is the internal authority of your own earnest self, your own conscience, your own soul. Read, think, do only what your soul approves."—*John Russell.*

* * *

Kitchener and the Gordon College.

HE wanted £100,000, and he doubted whether he should get it. In vain his friends urged him to make his appeal. "No," said Lord Kitchener, "nothing less than £100,000 will be of any use. It is a large sum. I should not like to fail, and if they gave me only part of the amount, to have to return it." He was told that his name would be enough. It was the psychological moment. Delay would only injure his chances. Lord Glenesk offered Lord Kitchener £1,000 across the dinner-table, and other sums were offered there and then, and the support of two powerful newspapers was promised. Still he hesitated, and still he repeated, "I should not like to fail." At last one of the company said, "Well, Lord Kitchener, if you had doubted about your campaign as you do about this, you would never have got to Khartoum." His face hardened, and his reply was characteristic of the man: "Perhaps not; but then I could depend on myself, and now I have to depend on the British public." But he did ask for the money, and got all, and more than all, he wanted, with no difficulty whatever. It appeared that the British public also was to be depended on.—*Pall Mall Gazette.*

* * *

Printing without Ink.

THE newest invention in printing dispenses entirely with ink and its attendant intricate distributing mechanism. The process is entirely electrical. One electrical pole is connected with the forme of type, and the other pole with the platen which carries the paper and presses it against the type or block to be printed. The result of the impression is that a clear imprint of the characters is obtained. The process is extremely simple, and dispenses, furthermore, with a considerable amount of the essental preliminaries in printing operations described as "making ready." Normally the imprint thus obtained is a sharply defined dense black, as is usually required; but, if desired, any requisite tint can be obtained. This latter development is probably the greatest feature of the process, for it renders colour-printing extremely simple. Instead of there being a certain delay between the red, blue, and yellow printing, as is now essential to permit the successive coats of applied pigment to dry, the three impressions can be made instantly after one another.—*Chambers's Journal.*

* * *

Outdoor Improvement for the Country School.

THE country schoolhouse and grounds should be as attractive as the best farm home in the district. This does not imply that the building must be as expensive as the farmhouse, or the grounds as extensive as the farm. It does mean that the educational plant—the school premises—should exert an influence as wholesome as that of the best country home. The best money spent for educational purposes is that spent to secure the best physical conditions possible. This implies large, beautiful playgrounds, a comfortable building sanitary in construction, with proper heating and ventilation. The health of the children is to be considered first. Of what use

is it to be able to work every problem in the arithmetic, or parse every word in the grammar, if the child's health is seriously impaired by poor schoolroom conditions?

If parents, directors, and teachers would come together in a parents' association, and discuss improvement of the physical conditions to secure better results, it surely would result in better schools. And better physical conditions for better work are fundamental in the improvement of the country school, and thus secure a more satisfactory country life for country children.—*The Winnebago County Schools Annual.*

RAINDROPS do not always have the same size or weight, and this is primarily due to the fact that they are not formed like the drops of water that fall from a wet cloth or the spout of a pitcher, or the drops that rush out of the small holes in a garden sprinkler. In all these latter cases a solid stream of water is broken up into drops; but the raindrops are formed in the cloud by the accumulation of minute atoms of water drawn together into one drop, and sometimes by the melting of a large snowflake or a solid little icy hailstone. When a drop is thus formed in the clouds, it begins to fall, no matter whether it be large or small; and observers in balloons state that all sizes of drops are to be found within the clouds themselves, from the finest fog and drizzling mist up to the heavy rain. It is commonly said that the bigger drops fall faster than the smaller ones and overtake them and grow bigger. This sounds reasonable, but no one has really proved it.—*February "St. Nicholas."*

The Size of Raindrops.

OUR conclusion is unanimous that some amount of definite grammatical instruction, varying with circumstances and aptitudes, must be imparted to our scholars, chiefly for the following reasons:—

An acquaintance with the leading principles of elementary grammar serves to give emphasis and point to the teacher's correction of the errors his pupils make in speaking and writing. The simple concords, for example, are reducible to rule, and these rules are made most conveniently available for reference by their being stated in technical terms—the language of grammar.

The Need for Grammar.

As the pupils progress, it is found as a rule impossible, except in a very cumbrous and unsatisfactory way, to discuss such important matters as the structure of sentences, the phenomena of growth, change, and decay which make up the life history of a language, or the characteristics which distinguish one writer or one period from another, unless we are able to assume some knowledge of grammatical facts, and some familiarity with grammatical terminology; while their absolute necessity, if the child is to attempt the study of a foreign language, will be generally admitted.

But not only does a knowledge of grammar facilitate and systematise the labours of the teacher; it is of real advantage to the pupil as well. We wish him to pass over the period of tutorial correction and arrive at the time when he can intelligently criticise his own efforts and amend his own blunders. This can surely best be done when he has learnt to examine and register the standard usages of our speech; to refer to them as criteria of accuracy, to employ them as a means of avoiding errors and of resolving doubts, and as an antidote against the uncertainty and degeneracy to which one who has learnt merely by the influence of good examples is especially liable when these models are for any reason no longer available. He thus becomes his own examiner. His imitations become more rapid, more intelligent, and less liable to error. He gains by their help a certainty and facility which the study of mere corrections could never secure.—*The L.C.C. Report on the Teaching of English.*

IN the above mentioned report a scheme for a school magazine is outlined, and the following are suggested as desirable features:—

The School Magazine.

1. A short chronicle of the events of the month, told in such a fashion as to interest children.
2. Original stories, serial or otherwise, suitable for boys and girls.
3. Biographical sketches of great personalities.
4. Extracts from English literature in prose or poetry connected with current events or anniversaries.
5. Articles on London history in its association with buildings, streets, or districts.
6. A reproduction in each number of some noted picture or portrait, or a representation of some building of historic or architectural interest, with simple descriptive details.
7. Essays, or other school work, of exceptional merit.
8. Problems for solution in such subjects as literature, history, geography, and arithmetic.
9. Accounts of pupils' visits to places of interest in town or country.
10. Records of special achievements by pupils or ex-pupils in any field of distinction.
11. A correspondence column.
12. A page for parents.

IN the *World's Work* Frances M. Björkman describes how her own and her husband's expenses were diminished by the teaching of Fletcher, the apostle of reduced diet through complete mastication: "At the age of fifty-eight, and after he had lived for ten years on about one-third of the food that physiological science has declared necessary for the maintenance of physical efficiency, he had doubled the best record of the best athletes at Yale, easily and without having previously undergone any physical training whatever. Furthermore, he told us how, during an endurance test made three years before, he had beaten the records made by the best men of the Yale boat crew, while living on a diet of cereal and milk at a cost of exactly 3½d. a day—this without imposing any artificial restraint upon his appetite, and without practising anything like self-denial." The writer adopted his principles, chewed thoroughly, ate less, gave up meat, and reduced their joint-food account to less than 1s. per day.

The Simple Life.

WITH the coming of Jesus the child suddenly assumes a new importance. I need not dwell on the importance He always attached to the children. Any one who reads the Gospels cannot fail to see this. The whole wonderful Christmas story is the apotheosis of the child. Into His kingdom there was to be no entrance for any one who did not repent and become as a little child. But when Christ died, that profound element of His teaching was neglected and forgotten, and men went back to their weary, grown-up ways again. In the succeeding ages it was only an occasional mystic who kept alive the truth. That great soul Augustine, in his Confessions, tells us of his childhood in a fashion that still deeply moves the heart of men. But in general the child was forgotten, until the Renaissance once more turned our faces towards the Golden Age. In the art of the Middle Ages, in the many holy families of the painters, in the "Melencholia" and many other pictures by Dürer and his school, in the lovely children of Luca della Robbia, we see the thoughts of men turning wistfully to the possibilities of regeneration and renewal that lie in the heart of a little child. Curiously enough, that great mystic, Dante, scarcely comes near this subject.—*The Christian Commonwealth.*

The Pattern Child.

ONE is very much tempted to generalise about children because they are, as a matter of fact, so very much the same. In one school in a poor district very much the same conditions are found as at another school in another poor district. Sometimes the uniformity is almost startling. Some things are quite stereotyped. Clothing and boots, for instance, are for given classes of children almost exactly the same in similar schools, presenting the same defects and the same peculiarities. The education is, of course, very uniform; the homes in the tenement house or the model dwelling are of the same kind, and the children's appearance is not strikingly individual. Any one who studies a large number of children attentively in Lambeth, a similar number in Poplar, and again a batch in Camden Town, will note the recurrence of the same clothing, the same boots, the same type of face, and the same diseases. The diseases of school children are indeed monotonously similar from one school to another, and one would be very glad to do away with the amount of individual variation they imply by substituting a monotony of health. But in other matters an individual variation would be very attractive. A strongly individualised child is quite rare.—*Dr. L. Haden Guest.*

The Uniformity of Children.

NOTICE.

WILL readers who appreciate our efforts to provide a really helpful monthly journal show this number of *The Practical Teacher* to a friend who does not yet know the paper in its new form?

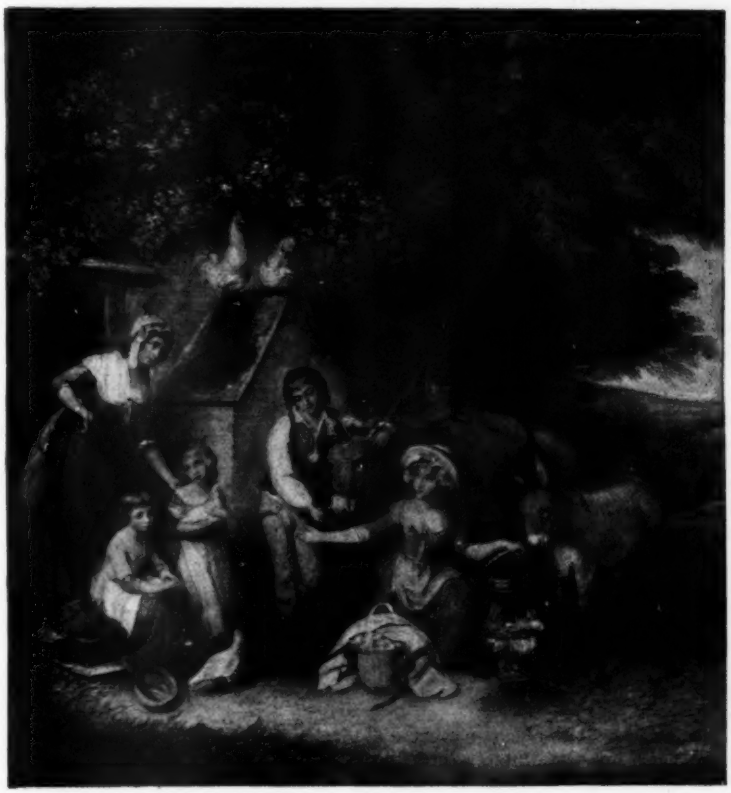
Our Art and Handwork Section.

OLD ENGLISH COLOUR PRINTS.

BY W. E. SPARKES.

How the Foundations were laid.—*Continued.*

IN our last number I showed how the mezzotint plate was engraved, and I must now say a few words about stipple and aquatint, in order to draw attention to the differences in colour prints due to the various processes.



"Saturday Morning: Favourite Chickens."
(Painted by W. R. Bigg, A.R.A. Engraved by W. Nutter.)

Stipple.—To engrave in dots, it was necessary first to cover the whole plate with a "ground" that would resist acid. Then the engraver drew his outline on the ground; and with needles of various sizes, using large blunt ones for the shadows and very fine ones for the lighter tints, he obtained a wide range of tones. These needles exposed the copper plate wherever they touched, so that in the first stage the picture appeared to be made up of an infinite number of bright points, the copper showing through the black "ground." Acid was then poured over the plate, finding its way down to the copper through the tiny holes and eating into the copper. After a time the "ground" was melted away and the acid washed off.

Evidently such a plate, covered with ink and then wiped with a dry rag, would retain the ink in every tiny hole. A damp sheet of paper placed over the plate, and then pressed heavily on it by rollers, would give a reversed print made up entirely by dots.

Aquatint.—Just as in "stipple" engraving, the object was to cover the ground with dots, or (by another

method) with a tiny network. Very finely powdered resin, or asphaltum, was put into a large box, which was then whirled rapidly until the whole space had an almost even atmosphere of powder. Into this smother a plate was carefully placed, and the box allowed to rest. A fine shower gradually settled down on the plate, which was then slightly warmed. This warming partly melted the resin and made it stick to the copper. Now it is evident that a magnifying glass would show the bright plate shining through between the resin powder in all parts.

If acid is poured over such a plate, it will not attack the resin, but will eat its way into the copper between the powdered resin, just as it would do in a "stippled" plate. If the acid is left long enough it will eat its way under the resin, and so make larger holes in the copper.

When the plate was ready, acid was poured over it and then washed off. If the resin were now melted away and ink first pressed over all parts and then wiped off with a rag, it is evident that the little hollows made by the acid would retain the ink, which would print with an even, gray tint made up entirely of small dots.

But as the object was to get different depths of tone according to the shadows, the engraver did not clear off the resin after he had poured on the acid and then washed it off. Instead of that, he took a brush, and painted over the parts that were to be printed lightest with a varnish which would resist acid. He then gave the plate a second bath of acid, which, of course, gave a second biting to the parts not protected by the varnish.

If the plate were now cleared of the resin, and printed, the picture would be made up of two tones, one darker than the other, the lighter showing the depth due to the first bath, and the darker made up of larger holes eaten into the plate by the double bath.

Then those parts which were now dark enough were, in their turn, painted over with varnish, and a third bath given. In this way, by multiplying the number of baths, it was possible to get a great many different tones.

When the engraver felt satisfied, he melted the plate, washed off the resin and the varnish, and found the copper covered with various "fields" of dots, larger or smaller, according to the number of baths each field had received.

In both "stipple" and "aquatint" engraving, the results could never be exactly what the engraver aimed at. He therefore took the copper plate, and with sharp tools deepened the dots here and there. Here the greatest skill was requisite, so as not to let the graver show too clearly.

Spirit aquatint differed from the above method only in the way in which the resin was put on the copper plate. Instead of taking powdered resin, the engraver dissolved a little in spirit. The solution was poured over the plate and allowed to dry.

Now when resin dries from such a solution, it does not cover the whole plate with an even coating, but it forms the tenderest possible network, like a fairy gossamer, leaving the copper to be seen everywhere between the innumerable threads. The "powder" method leaves dots and spaces round each dot; the "spirit" method encloses little "lakes" of copper surrounded by threads of resin.

The acid and the varnish were then used precisely in the same way as explained above. You can discover which method was used by looking at a print through a magnifying glass. The "powdered" plate is seen to be covered with innumerable dots; the "spirit" plate is made up of fairy rings, but all connected with one another.

How the Colour was laid on.

Old English colour prints were really artistic, because the colours were to be laid on *the copper plates* by a man with a good sense of colour.

There had been attempts to use separate blocks for each colour. For instance, in 1754 a Mr. Jackson had used wood for this purpose. Let us suppose the print was to have five separate colours. In that case he made six separate blocks. One, to be printed in black, gave all the outlines. Then another, say for the red in the picture, was cut out of wood, so that every bit of red (it may have been a cloak here, or the roof of a cottage there, or in another part a bunch of flowers) was represented by a surface of wood standing up above the other portions, which had been cut away, in order that the red printer's ink should not touch them.

In fact, if you took that block only, and printed from it, you would get merely a few patches of red; if you printed it carefully on *a sheet which had already received the outline impression*, you would have an outline picture with a red cloak, a red roof, and red flowers showing.

If you took another block for the blues, another for the greens, and so on, and then printed these one after the other *on the outline print*, you would at last obtain a plate in all its colours.

This is putting it very crudely. Of course some tints might be purple. These parts would have to appear on *both* the red and the blue blocks, so that when printed one over the other a purple would be obtained.

Years before Mr. Jackson had tried his hand, a clever Frenchman, Christoph le Blon, born in 1667, had used a method curiously akin to the modern "three-colour" process. He used metal plates and only three colours—red, blue, and yellow—and consequently only three blocks, obtaining his greens by printing blue over yellow, and his purples by using red and blue. He obtained very good results, and his rare plates are valued by collectors.

All these processes with separate blocks required immense care to make the different colours fit into their right places. It was so easy to have the red block, for instance, shift a little in the printing.

The "Old English Colour" Method.

The old English colour printers went much more directly to work. Sometimes they employed "tinters," who coloured the print by hand, and became extraordinarily expert. That great artist, Turner, was a "tinter" in his youth. He always congratulated himself on the practice this gave him in deftness and exactitude.

But "tinting" passed out of fashion. To take its place, the colour printer took the metal plate (whether mezzotint, stipple, or aquatint), and *on this plate* he painted all the various colours he needed. These colours were forced into the tiny holes by means of stiff brushes; but, of course, the colour also covered the smooth parts of the copper. When all the colours had been laid and were still wet—it is evident the artist had to work quickly—a rag was taken across the plate, so that only the tiny hollows retained the colours. The plate was warmed, a damp sheet of paper placed over it, and then

both plate and paper put under heavy pressure, which forced the colours out on the paper.

A magnifying glass would therefore show that such a colour print is made up of *points or dots of colour*—a safe test in deciding whether any print you may pick up is really an old colour *print*, or only a mezzotint, stipple, or aquatint coloured with a brush by hand.

Of course it was very seldom that the colour print was quite successful. In fact, the artist would be obliged to fill up deficiencies in various parts by painting on the print itself with water colours; but as this would be done only in parts, the main portions of the print would be coloured in dots pressed out of the tiny hollows by the original printer.

Differences in Colour Prints.

If the engraver had tried in this way to put his colours on an unworn mezzotint plate, the "burr" (as I pointed out last month) would hold the colour. A rag wiped across the plate would not remove enough colour, and the print would be too heavy.

After the "burr" had been smashed down in the press, the plate would be almost useless for mezzotint printing, but it was now in a fit state to receive colour. I suppose it was due to this that colour printing came into favour. A fine mezzotint plate is soon worn away, so a thrifty printer in collusion with the artist would use the worn plate as a basis for a colour print; for even now it would hold much colour.

The holes made in "stipple" engraving had absolutely no "burr," and would consequently hold less colour than even a very worn mezzotint plate, for which reason you will find the colour less "full."

As to aquatint, the holes are smaller still, and a coloured aquatint—that is to say, one coloured by printing, not by hand with a brush—is mostly very slight in its tones. Aquatints, in fact, were often considerably painted by hand to make up for their defects in colour printing. They are, in consequence, less valuable than "stipple," and especially than mezzotint, colour prints.

The Colours of Colour Prints.

I have just spent a pleasant holiday in looking over some hundreds of old English prints in the Print Room, British Museum. Among these several are coloured. A few are really admirable colour *prints;* several are partly printed, with the deficiencies made good by painting by hand; and many are painted entirely by hand.

The differences can be readily detected with a reading-glass, but after a little experience it is not difficult to sort them at a glance. Those painted by hand have almost invariably a *muddy* look; and, in the same way, the additions made by the brush to the real prints show up unmistakably. The colour prints, however, are delightfully fresh; for since, as I have pointed out, these prints are obtained from the tiny dots of colour that lay in the innumerable hollows which compose the mezzotint, stipple, or aquatint plate, evidently these dots are separated by clear paper on which very little colour was allowed to remain. The effect is exactly as though an artist had painted the picture with a hair-like brush, with which he dotted the paper, in various colours, in all parts. There is thus an atmosphere, a glistening play of light, which sparkles and keeps the colours clear.

Another result is that, though each dot is made up of bright colour, these dots are so far separated and islanded in white that the general tone is subdued, just as though you were to lower the tone by mixing white with it. Not that you would get brilliancy as well as low tone if you mixed white with a colour; indeed, no better plan for securing a dull and muddy effect could well be employed. The modern French impressionists have discovered a remarkable fact—namely, that to get a clear green (for instance), that is only possible by placing blue and green patches or dots *side by side*, and certainly not by mixing them together on the palette.

Without knowing this, the old English colour printers had secured brilliancy by printing only from the tiny hollows of paint. The colours blend delightfully and in the tenderest fashion; they look as though they had all quietly faded with time, which had, however, maintained a just action, so that no colour should be more glaring than the others. Yet they are as bright as on the day the printer took the print out of his press. No wonder they were eagerly purchased, and that so few really fine specimens are to be met with to-day. For the printer was obliged to make a fresh painting on the plate for every impression; from which fact it may be readily seen that no two colour prints were precisely alike. They all have the same exquisite, softly blending colours like the tenderest silk; they would be admirably in harmony with the quiet-coloured furniture so much an object of careful selection among the cultured classes of the "tasteful" Georgian period.

It should be remembered, too, that the water-colour painters had a very limited scale of colours. These they had to manufacture for themselves mainly from coloured earths and even coloured stones. They would have been amazed at the range open to painters nowadays. In fact, it may be safely said that, beyond a few brilliant blues, reds, greens, and golden yellows, they had a very limited choice. But the colours were nearly all permanent, and the painters were spared the disappointments—now, alas, only too common—of finding their fine colours not only fade, but often completely change other tints with which these fading colours are mixed.

Evidently the old English colour prints would not satisfy a man trained to see infinite colours even in the grayest scenes. The sense of colour has been educated to a marvellous degree, due probably to the great range of pigments, which have been added to year after year. The old prints show red-coated and blue-skirted women; the trees are undoubtedly green, or with a few broken tints. The marvel is that the effects are so satisfying. But, as I have said above, this is due to the softening in these brilliant colours brought about by the immense number of white points of paper.

Our Examples.

Wheatley was well served by his engravers. His pretty people appear in stipple, aquatint, and especially in mezzotint, in great quantities. The two engravings published last month ("Morning" and "Evening") are mezzotints by a clever but hardly first-rate man named Gillbank. The reproductions show how much the mezzotints had been worn down in the press, for almost all the half-tones have disappeared, while the deep shadows under the vine, and in the shadows everywhere, are clear and insistent. But these marked differences are all to the good, since the original unworn

plate would have held too much colour in the lighter portions, and would have resulted in a rather dull and uninteresting heaviness. I ought to point out that the plates were very large—more than two feet in length.

"SATURDAY MORNING" AND "SATURDAY EVENING."

These plates are still larger. They are magnificent examples of stipple engraving. The painter, W. R. Bigg, was an Associate of the Royal Academy. It is needless to point out the strong family likeness in the every drawing-room. Certainly the styles of both the lady painter and Burke harmonised admirably. His stippled plates are marvellous for their extremely minute work, so that you need a fairly strong glass to trace the delicate tones he used to express softly-rounded faces and limbs. At the same time, he knew how to obtain strength by opening up larger dots in the shadows by means of his graver, and thus maintain a balance and a brilliancy due to contrast that together reveal the sensitive artist. And the same is true, to a large degree, of William Nutter, the engraver of "Saturday Morning."

"SATURDAY EVENING: HUSBANDMAN'S RETURN."
(Painted by W. R. Bigg, A.R.A. Engraved by T. Burke.)

aristocratic people who appeared on all the canvases in those days; and as the engravers were trained in the same school, they managed to retain the same sugary-sweet expressions in all their engravings. Of course there were subtle differences, since each engraver also had his ideal, which, *nilly willy*, controlled his work. For instance, Thomas Burke, who engraved "Saturday Evening," delighted in large eyes, almond limbs, and the softest tones.

He was an Irishman, one of the brilliant band from Dublin. He was the favourite engraver of Angelica Kauffmann, whose classical ovals were to be found in

CONCLUSION.

We turn from these old English colour prints with mixed feelings. They reveal an age strangely at variance with ours—an age whose taste in art is curiously foreign to modern ideals. We remember that these prints are taken from paintings which had a tremendous vogue, and we read behind them a softly sentimental people finding delight in themes that would be brushed contemptuously aside in a sterner age. One would think there was a reaction in those days towards the simpler life, as though the vanity, the frivolity, the extravagance and excess had palled on an overwrought

society, who tried to persuade themselves that, after all, their dearest hopes and loftiest aspirations were to be found in simplicity and sentimentality. The titles of the prints themselves are illuminative—shepherds reposing; peasants gathering wood; cottagers going to market; and, as a companion picture, cottagers returning from market. Often the minor poet lent his gentle aid. Think for a moment of the round-featured young ladies in large hats and bows, each with her appropriate verse. The Delias, Pamelas, Clarissas, and Cecilias look out from their oval frames with a conscious knowledge of their own comeliness. When they are not country maids, they are anxious to let us know how much they admire rustic simplicity.

Even the unfortunate, drinking George Morland painted these tender themes for greedy picture dealers to save himself from the debtor's prison. Here is one, "Delia in the Country." The minor poet adds his touch to the engraver's art.

> "At length from Town the Peerless Maid
> Disgusted seeks the rural Shade!
> Retired from Sol's Meridian Beam,
> Where Zephyr fans the cooling Stream,
> She yields beneath the sheltering Bower
> To Contemplation's Eye the Hour,
> Pleased with a Simplicity to live,
> A Blessing Cities cannot give."

There we have it in Roman capitals—vocal Groves, Sol's Beam, purling Brooks, grateful Shades, and sweet Simplicity. Bring me my shepherd's crook, Amanda, and let us away from the giddy town to taste the joys of rustic peace! Ah! those happy peasants, theirs is surely the sane life. They have no Sheraton furniture; they are not carried hither and thither in stately and stuffy Sedan chairs; they breathe the air while we whirl away to card-rooms, or to drink the waters at Bath or Tunbridge Wells. Let us leave it all for ever—or, perhaps, if that would be too great a wrench, let us at least buy some of Mr. Wheatley's, or Mr. Bigg's, or Mistress Kauffmann's simple peasantry for the parlours of our town house, so that we may be in the fashion, and may proclaim to all the world that our hearts are not in the gay world.

In the meantime, and before we take the final step, order the carriage and four horses, and let us visit the opera to criticise the latest Italian dancer—Auretti.

> "The fair Auretti, free from Blame,
> Received of Heaven and of Men,
> The Soul of Ballet and the Dance,
> The Gift of Flying in Ballance."

And la! for goodness' sake, shut the carriage windows, that we may not see the vulgar people in the streets.

NEEDLECRAFT FOR PRIMARY AND SECONDARY SCHOOLS.

BY ANN MACBETH AND MARGARET SWANSON, INSTRUCTRESSES AT THE GLASGOW SCHOOL OF ART.

THE Board of Education recently issued *two* important Circulars—719 and 730—on the Teaching of Needlework in Schools. The aims and methods set out in these Circulars are generally at variance with the work now done in schools, but no one can doubt that they are for the better.

For example, in paragraph 3 of Circular 719 it is said, "The handicraftsman is also an artist," consequently we argue the craft of the needle is an art. In other words, needlework and drawing being related, the one should be able to explain a little about the other, as well as be of some assistance. In drawing we draw with the pencil; in needlework we draw with the needle. We emphasise this very specially, to the better understanding of our scheme. Between the primary and secondary schools there is an organic difference. The child of the primary must leave at fourteen years of age; the child of the secondary may continue for some years longer. The one is more likely to become "the hewer of wood and the drawer of water," the other more likely to become the director. While science and art are doing much (science showing what can be done for the feeding and cleaning of the body, art showing by pencil and brush what can be done for the mind), the same cannot be claimed for that branch of combined science and art accomplished by the needle—the simplest and cheapest of all tools—in creating and beautifying our homes and our personal attire.

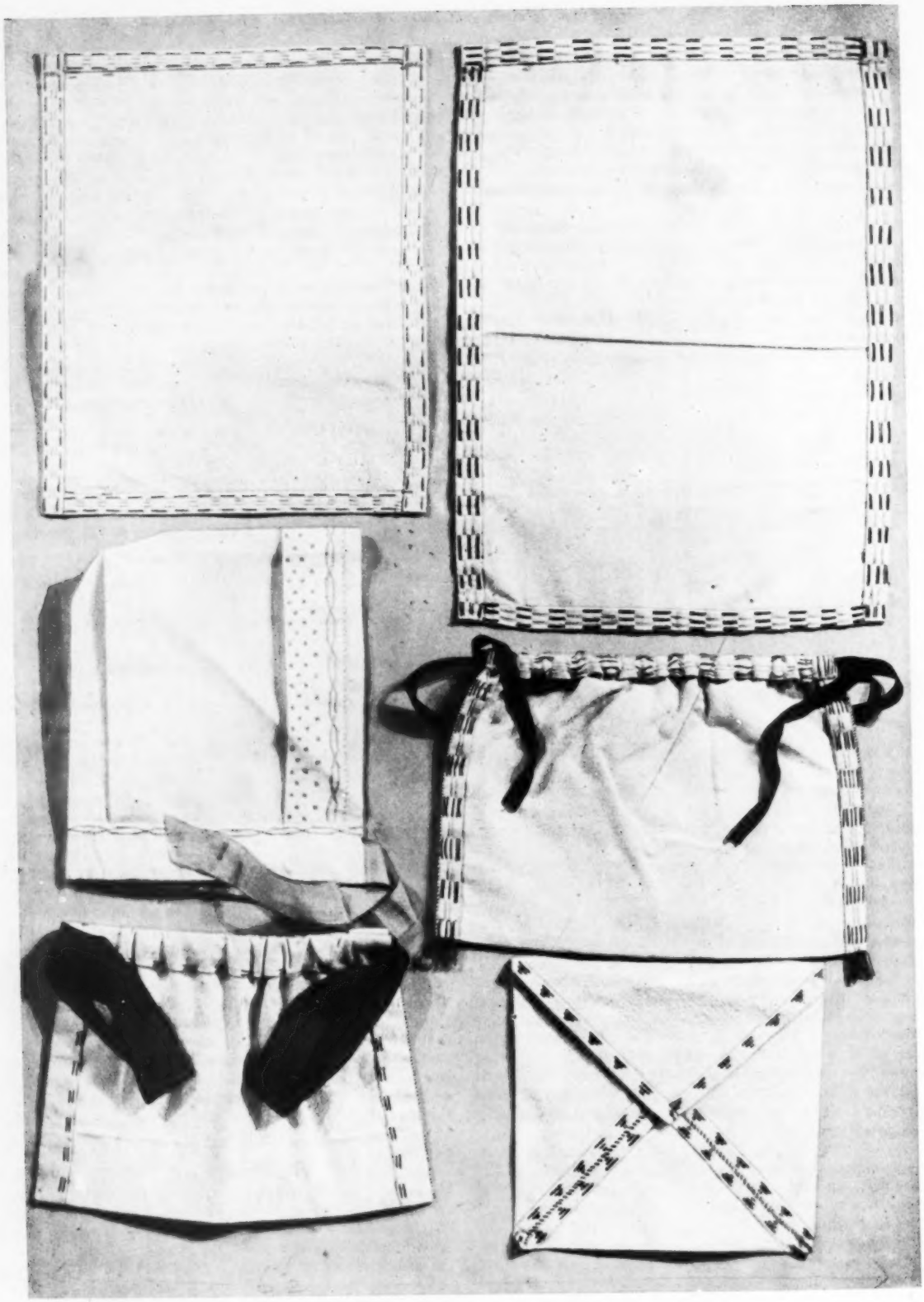
The "white seam" which ruined many eyes—the "specimens," $5 \times 2\frac{1}{2}$ inches, of the present day, sewn in both cases with fine No. 50 or 60 thread and fine No. 7 or 8 between needles—coloured thread *for the convenience of examiners*, not for the sake of the child's eyes, are now to be laid aside; and we propose to give a few papers dealing with needlework in a practical, educational, and artistic manner.

Our work is graded according to the eye and age of the child in its relation to beauty, usefulness, and economy. The first paper deals with work suitable for children from six years to nine years; the second paper will show what is suitable for scholars from nine to twelve years; the third from twelve to fourteen years; the fourth from fourteen years onwards, with due regard to the decorative value while upholding the practical side of the needle. Supplementary, secondary (beyond fourteen years of age), and the work of teacher students, along with continuation class work, will each be dealt with, and afterwards applied design of a simple nature.

But we maintain that the wording of Circular 719, which says that "needlework belongs to the number of those subjects which are a means and not an end in themselves, and which must therefore justify their existence by being of practical use," is on the same par as concluding that the sea justifies its existence by being of practical use. But what does the artist within us think of that as the sea lies calm, flushed with the pink of morning, or as the white horses prance through the dark blue?

And Froebel's oft-repeated axiom, "The child learns by doing," offers endless possibility to the child, to the maid, to the matron. For the educational value of the needle—"learning by doing"—outweighs any little immediate material consideration, although, truly, the greater here, as elsewhere, comprises the less.

We have started recently a new scheme of instruction for needlework at the Glasgow School of Art in connection with the classes for teachers under Article 55, which



runs very much on the lines suggested by the writer of Circular 719, and it has been attended with remarkable success.

As all must recognise that needlework is a valuable hand and eye training, it is obvious that this training must be adapted to the gradually focussing eye, the strength of its muscular sensibility, and the small hand of the growing child.

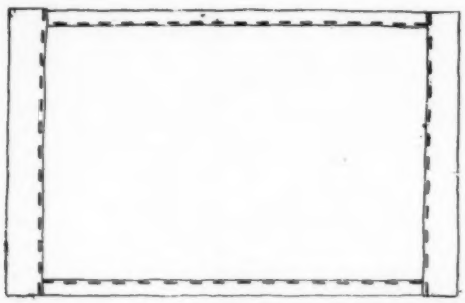


DIAGRAM 1.—A small mat or tray-cloth with hems turned to the outside and *tacked* with coloured threads.

And *colour* and *form* rightly applied give the solution of this.

As regards *form*, the size and direction of the stitch must be large and distinct, without any complication. For this reason—and because it is, as it were, "the child's discovery"—we begin with *tacking*. In far Japan the little Japanese children have begun with tacking for generations, and they tack together at a tender age their world-famed kimonos.

Not long ago the white handkerchief, sewn with *small white* stitches—the smaller the better—obtained in the majority of schools: an instance of misdirected handwork, as useless as drawing with white chalk on a white board, a strain on eye and temper for every child.

As regards *colour*, the child resembles the savage in his love for strong contrast; and if he discovers to us his exuberance in crude colour, we may take advantage of this in considering the colour of our material with

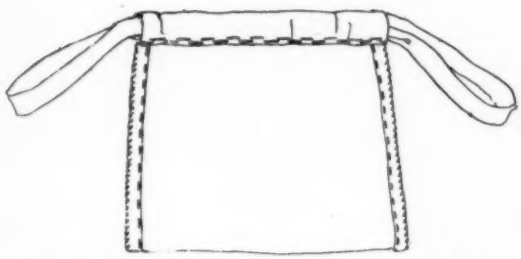


DIAGRAM 2.—The mat doubled and the sides *top-sewn* to form a small bag.

the size of our stitch, and the stimulus which colour gives to the child's activities.

Diagram 1 is our *type* (a small tray-cloth), which can be tacked in as many different ways as there are inventive human beings. The material to be tacked is soft, unbleached calico, 3d. to 6d. per yard. The thread is No. 18 green embroidery thread (Clark and Co., Paisley), and the needle No. 3 Scientific Needles (Kirby, Beard, and Co., Redditch). The spaces left in our Diagram 1 may be filled in with a red tacking thread to complement the green, and that with the creamy background would give a harmonious, if primitive, colour scheme at once.

The child distinguishes normally between the thread and the material, avoiding thereby that *closeness of range* so detrimental to the eyesight.

Incidentally, without even speaking of art to the child, much can be done through needlework to feed the colour-starved sense and direct it into a right feeling for what is good.

Diagram 2 illustrates a little constructive lesson. The tray-cloth of Diagram 1, which has been elaborated by experiment, which has taught them exactness in the measuring and spacing, is now to be doubled up and *top-sewn* along the sides to form a small bag. While the child may be disappointed at first to see the apparent destruction *as* a tray-cloth, this is more than balanced presently by the joy of a fresh construction or

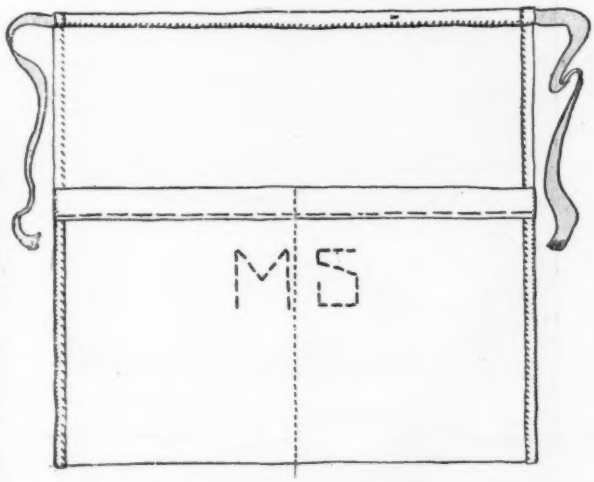
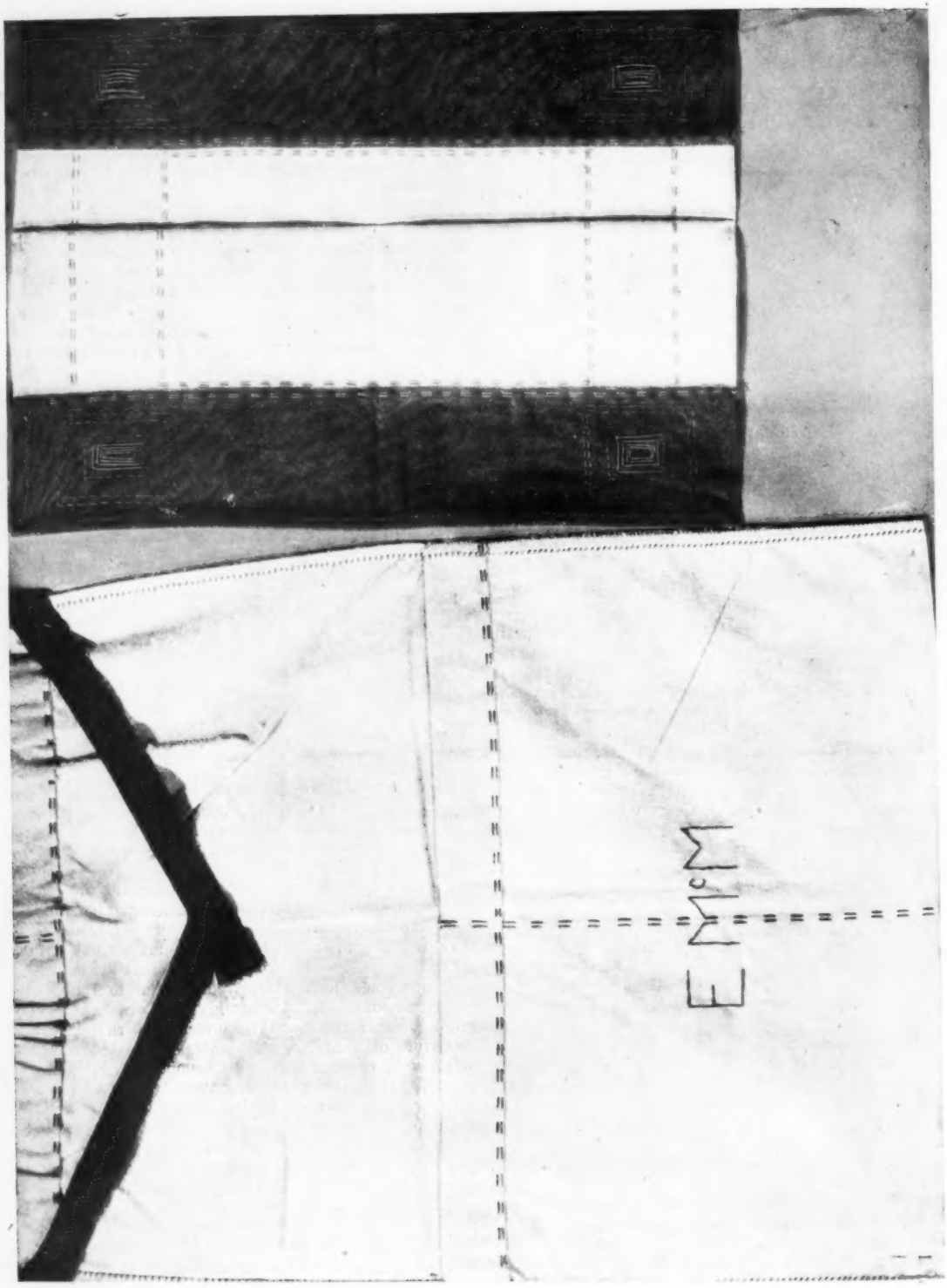


DIAGRAM 3.—A child's lap-bag with *hemmed* edges, the sides top-sewn. The division between the pockets in tacking the initials in straight lines may also be tacked.

synthetic effort through destruction or analytic effort; and from this time on endless experiments cultivate the child's inventiveness and ingenuity. Quoting from paragraph 3 of the above-mentioned Circular 719: "She has produced that which did not exist before, and her constructive faculty has been exercised and strengthened." And in paragraph 5 we read: "The more a child is helped to understand the why and wherefore of things, and the more her reasoning power and sense of proportion are developed, the greater, of course, is the value of her education."

Diagram 3 shows a lap-bag, suitable as a type for children from seven to eight years of age. Between seven and a half and eight years *hemming* is started, and then not more than six or seven stitches should be allowed to the inch. Nature guides the child more happily than the teacher to the *right* size; for while the eye of the child is still long-sighted, a certain percentage may have inherited myopia: consequently the stitches demanded by Nature in the growth and development of the eye will be larger in the one case than in the other, at the same distance of range.

No. 3 scientific needles and No. 18 embroidery thread



NEEDLECRAFT FOR PRIMARY AND SECONDARY SCHOOLS

should still be used. The hems are turned to the outside, thereby gaining a pretty, decorative effect. The initials are run by tacking, after having been drawn in lead-pencil, though drawing with the needle and thread as the child sews is to be encouraged.

Diagrams 4 and 5 illustrate types for children between eight and nine years of age. In the case of the sash curtains the child discovers the *use* now, as it already knows the artistic value, of the tacking stitch; for although comparatively hid in this new exercise of false hemming, yet by it the contrasting material adds

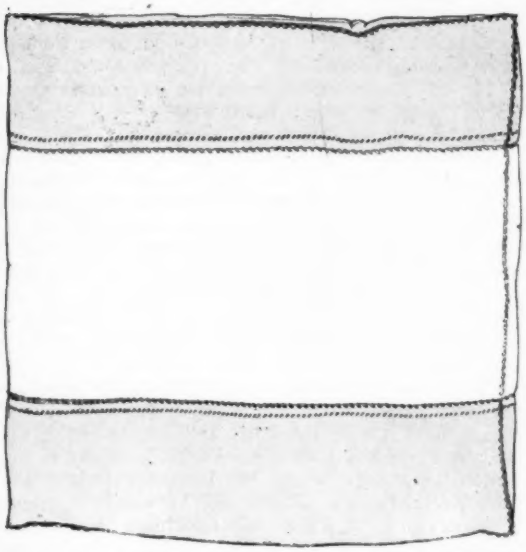


DIAGRAM 4.—A cushion cover in two colours of cotton material joined by *sew-and-fell* seams. The edges may be top-sewed.

weight and beauty to the edge of the curtain. We use unbleached calico with bands of coloured calico (green), and hem either with blue or mauve thread (embroidery, No. 18, Clark and Co., Paisley).

The cushion-slip introduces *sew and fell*—a combination of top-sewing and hemming. Not for some time will this combined and strong, useful stitch be performed with that regular repeat which forms its restrained decoration. But the knowledge that combined stitches exist stimulates the child to experiment and combine tacking with hemming long before "run and fell" becomes a systematic lesson. And this is what we want—that the child should discover, by recalling and fusing together for itself. The scheme of colour is again unbleached calico, coloured calico (green), and No. 18 embroidery thread, with No. 3 scientific needles. The colours of the thread gradually develop into a harmony rather than a direct contrast as the eye becomes capable of appreciating refinements of colour and the atmospheric blues, greens, grays, and purples take the place of the hot reds and yellows the child revels in in the beginning.

We close our suggestions for the junior side of the school by insisting on the need of experimental work weekly. In this way the child should have flannel, flannelette, or serge to shape and tack together, or may

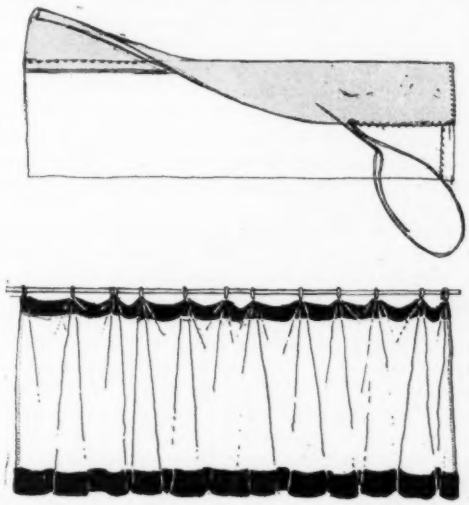


DIAGRAM 5.—A small casement curtain with *false hems* in colour as borders.

construct the shapes in paper and fold them neatly. The tasks should be small, in order not to weary her, and in the form of some usable article, not merely as samples. We quote from paragraph 3 in the Circular:—

"In order to make needlework as educational and as useful as possible, it is essential to make it interesting." And further on: "Nothing is so discouraging to children as to feel and see that their work has been done for no purpose, and only to be looked at and thrown away. The working of so-called 'specimens' should therefore be entirely discouraged, except in so far as the practice of new stitches be necessary."

The illustrations on pages 514 and 516 show a variety of examples and stitches on the principles enumerated above.

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1. *Problems in Wood-turning. By Fred D. Crawshaw.*
2. *Simplified Mechanical Perspective. By F. F. Frederick.*
3. *Wood Finishes. By F. F. Frederick.*

(*Manual Arts Press, Peoria, Illinois.*)

Problems in Wood-turning is a companion handbook to Mr. Crawshaw's excellent *Problems in Furniture Making*, reviewed in a previous issue of the *Practical Teacher*. It deals fully with the technique of turning, and gives a number of really good examples for practice. Where the lathe is used this book should also be found.

Simplified Mechanical Perspective shows the direct way of getting the scientific representation of objects without the elaborate use of vanishing points and measuring points. Most useful for all who have to draw objects of somewhat rigid form.

Wood Finishes is a short whimsical essay upon working in wood. Beneath its playful satire, however, there is a substratum of truth and common sense which will not be lost upon the thoughtful craftsman.

NORTH OF ENGLAND EDUCATIONAL CONFERENCE.

THE North of England Educational Conference held recently at Leeds brought out some very interesting papers. Perhaps that which concerns us most closely was read by Mr. Radcliffe Carter, on "Modern Ideas in General Art Instruction." Mr. Carter is the author of a book on the teaching of drawing, recently reviewed in these columns; and though agreeing with some of the criticisms made by Mr. Cadness and Mr. Knight, we think Mr. Carter's paper is worthy of very close attention by every teacher. In the main the principles advocated are sound, and would lead to thorough work. The following is the complete paper:—

"I have been asked to deal with 'Modern Ideas in General Art Instruction.' The subject is a very large one, and in a brief paper like this must of necessity receive rather diminished treatment. I think I cannot do better than confine myself to one or two aspects of it which have changed most in recent years—namely, the modern aspects of elementary art instruction as given in primary and secondary schools.

"I need not tell you that the teaching of art—or, for the sake of simplicity, let me say the teaching of drawing—has almost entirely been remodelled in these schools, not only with regard to the methods employed, but also with regard to the purpose of the instruction. Drawing has at length come to be considered a necessary part of general education. That is a radical change, and the most modern of all modern ideas of art instruction. It is true that drawing has always been one of the subjects of primary and secondary teaching, but it is only quite recently that teachers, other than art specialists, have found it possessed of educational virtues commensurate with the time expended upon it. For a long time drawing occupied a curiously anomalous position in the schemes of primary and secondary education in this country. A certain tradition clung to it—the tradition that it was simply a kind of polite accomplishment, befitting any well-informed and cultured person. This view of it dated from those days when artists visited the private schools and the grammar schools to teach, as an 'extra,' a juvenile form of their craft. Art being regarded as one of the graces of life, it was thought desirable that the services of a person endowed by nature with a special faculty for the subject might suitably be employed to add a touch of this particular grace to the general education of youth. So long as this view lasted, it is not surprising that the drawing master was not seriously regarded as a minister to the real necessities of education, nor that in many instances he was given the refuse of the time-table—compelled to adjust his lessons to those periods when 'brain work' was over for the day, and scholars might fittingly employ themselves with their hands without undue strain upon their intellects. How far the drawing master himself has tacitly contributed to this view is another question. Without doubt there is something to be said for the headmaster who failed to recognise any serious educational advantage in the copying of lithographed landscapes, the repetition of conventional outline forms, and the unvaried study of abstract, geometrical solids. Whilst conditions of this type prevailed, one cannot wonder at drawing receiving a rather perfunctory regard from the secondary authorities.

"In primary schools unhappy conditions have also existed in the past. While drawing of a kind has been taught industriously, little or no conception of its relationship to a practical education has impressed the minds of teachers, until lately. The purposeless copying of conventional shapes in outline, from flat diagrams, has been the staple of the industry. Mechanical drawing, with ruler and instruments, has had a well-understood place as a necessary preliminary to handicrafts; but fluent and expressive drawing with the pencil, whilst it may have been taught sometimes in the form popularly known as 'freehand,' has been taught with but the dimmest perception of its possibilities in building up, or assisting to build up, the intelligence of a child.

"Happily, however, we see these conditions in process of change towards a better state to-day. A truth is being discovered which has always been obvious to an artist—namely, that drawing, properly undertaken, possesses a wonderful power of awakening or stimulating the latent faculty of observation. In other departments of education a child is being taught to distinguish between knowledge and information, to regard the one as a matter of observation and experience and the other as a matter of hearsay. At the same time the splendid properties possessed by drawing in the cultivation of that faculty of knowledge or observation are coming to be estimated at their true value. This discovery, as I said before, is the most modern and the most momentous idea in junior art instruction to-day.

"Let me examine the immediate effects of this discovery. There has been a wholesale discarding of conventional drawing. There has been a substitution of real objects for the abandoned 'copies.' 'Common object drawing' and 'Nature drawing' have become familiar phrases in the school vocabulary. Memory drawing and recreative drawing are recognised elements of the time-table. The supreme attractiveness of colour as a part of a drawing exercise is being admitted, and the constructive instinct of children is being fostered by exercises in fashioning the images of objects with modelling clay.

"In all these things the importance of developing the habit of graphic and plastic representation is implied, and the fact that such importance is now acknowledged is an excellent thing. But there would be more reason for rejoicing if there were a better general conception of how these so-called new ideas—which are new only in their present application—are to be reduced to efficient practical method. It is one thing to realise the importance of training a scholar to cling to the principles of observation and truthful representation, and quite another thing to set about this training in a practical way.

"For instance, while it is generally admitted that observation is the first principle of drawing, it is not, I believe, generally understood that the power of observation can be cultivated only by slow and gradual processes. Those teachers who think they have attained to the inner mystery of the 'new' drawing methods by simply placing objects before their scholars, and demanding observation thereof, are still only on the threshold of the matter. It is an imperious necessity for a teacher to tell a scholar, perhaps not *what* to see, but certainly *how* to see. To expect any average scholar to divine the mental methods by which he shall see the shape, proportion, structure, relief, texture, and colour of an object, is an absurdity of the grossest kind; and

yet I firmly believe that ideas as to how these mental processes are to be trained are still very often of a nebulous character. It may not even be generally accepted as a fact that the processes are mental. I am afraid that drawing is conceived in some cases entirely to mean a kind of cleverness with the hand. Undoubtedly cleverness with the hand is indispensable, but cleverness with the brain is the root of the matter. If this principle were understood as it should be, we should not have the drawing lessons pushed into the slacker periods of the time-table by subjects which are supposed to entail superior brain work. I think that all skill of hand is empty dexterity unless it be accompanied and governed by the purely intellectual power of seeing. And I think that this power of seeing is the educational asset of art instruction. The question to ask of any drawing done under educational auspices is not how attractive is it, but how much truth does it display? Such a test does not set aside the claims of beauty, but rather enhances them; and if such a test be made the groundwork upon which methods of art instruction are founded, it is perfectly certain that those methods will be right, however much they may vary in character—as they will vary—with the personality of the teacher.

"Now, if this test be accepted, what does it imply on the part of the teacher? To my mind, at least, it implies that the teacher of drawing in the future will require to be better trained in the art of perception than the teacher in the past. I refer especially here to the primary teacher, the circumstances of whose training in drawing, by methods which are now admittedly obsolete, have not left her or him with any special qualification for dealing with improved ideas. Immediately an object, natural or otherwise, is substituted for the old conventional copy, there are at least four more elements of aspect or truth to observe—relief, structure, colour, and texture; and as many new methods must be adopted—methods of seeing, or technical methods of representation—if an adequate drawing is to be made. If the whole subject is not to become involved in hopeless chaos, the teacher must become competent in all these mental and technical methods, and competent to impart them. It is an onerous responsibility, but it arises naturally out of the new conditions, and makes by no means an arbitrary demand upon a teacher's enthusiasm.

"It may be thought that it does by a section of educationists who have adopted drawing as one of the devices for providing young children with a means of spontaneous expression. To these enthusiasts clamouring for the natural development of a child's personality much may be conceded. We may willingly allow them that a love of the very exercise of drawing itself can be nurtured by encouraging children of all ages to express their ideas and their memories in spontaneous and uninstructed drawings which are not to be criticised from technical standpoints. Their doctrine is a revulsion from the old, mechanical, dreary drawing lessons of the past, in which respect it has the complete sympathy of all intelligent persons. But I have never been able to see any reasonable grounds for removing *all* the element of task from the drawing exercises of children. Most emphatically, I do not believe that a properly administered lesson in the art of seeing tends to cripple the individuality or stunt the mental development of any child, younger or older. I do believe that any kind of lesson which consists of absorbing formulæ prepared by the teacher may have such effects; but a drawing lesson, which is devised first to engage the scholar's interest in the object drawn from, and, secondly, to stimulate him towards a clear observation and a clear rendering of its total character, will call forth personal powers in a new direction. Whilst spontaneous drawing reveals the personality of the child to the teacher, the exercise of real seeing and drawing is the teacher's instrument in developing that personality towards the recognition of truth.

"Upon a foundation of such capability of seeing as I have suggested the whole structure of art can be built. Fact is the base, imagination the superstructure, dexterity the means by which the whole thing is brought to completion. These are the cardinal truths, as old as art itself, which should now pervade all modern ideas of art instruction.

"Having dealt with the principles, let me turn for a moment to methods of the newer schemes. The problem of complete representation has extended the use of the lead-pencil for the purpose of interpreting surface relief and texture; it has also brought in the use of the brush and colour for better ends than that absurdly misplaced practice of decorative brush-drawing and decorative pattern making, which ought never to have found its way from schools of design—its proper sphere—into primary and secondary schools, where the proportion of scholars to whom skill in design is of equal importance with skill in intelligent appreciation of visible truth is infinitely small. Colour is now being employed as artists have always employed it, for representing the aspect of real things without any diminishing of that æsthetic value which belonged to the older type of decorative exercise. To the technical methods of any kind of drawing generally approved I cannot now make more than a passing reference. I would rather deal with the methods by which drawing is being brought into line with other educational subjects. Memory or imaginative drawing is one of these methods, adopted because it is an infallible test of knowledge or mental capacity, because, unlike direct drawing, it has something of the element of creativeness; because, like any other form of personal expression, it tends towards the establishment of acquaintance with, and possibly confidence in, one's own powers. This character attaches to memory or inventive drawing at all times. We may draw unceasingly from the visible forms around us, and in so doing we shall, I believe, build up a permanent knowledge of them, a real capacity for visualising them completely in the mind; but the extent of this knowledge, so far as it is really clear in our minds, is to be proved only by our power of giving it expression in a representation drawn or modelled from memory. And by repeatedly exercising ourselves in this form of expression we come at length to a proper estimate of what we really do know, as distinct from what we believe we know. To be able to appraise our own powers or our own knowledge with some approach to justness is, I conceive, one of the best results of education. Nearly every other subject of instruction makes enormous demands upon the memory, and these other subjects call for memory of things previously *learnt*, consciously or unconsciously. The newer conception of memory drawing is making, or should make, a precisely similar demand. Therefore in some part the teaching of memory drawing becomes susceptible of method. It will be seen that the method by which it can be taught is simply that method of clear seeing which I have already touched upon. A thing is first consciously observed, and afterwards a representation of it is made away from its presence.

Or the exercise of memory drawing may call forth, very often, a realisation of things perhaps unconsciously observed—ideas, impressions, and facts casually acquired, and floating disconnectedly in the mind until a mental effort brings them forth into the light of conscious knowledge. But the inner strength of memory drawing is that part which is nourished by the continual effort of direct seeing. I do not think the practice I have seen in operation of causing children, some of them little more than infants in years, to make drawings from imagination, illustrating stories read to them, has as high an educational value as that of causing them to draw things from memory which they have had opportunity of deliberately observing. Whilst it is a wise plan to arrange that time should be given in all schools where art is taught in any form—primary, secondary, higher—for quite spontaneous drawing, and that scholars and students should be allowed to make in school hours, without fear of ridicule from the teacher, those unstudied efforts at illustration and invention which in the old days were made, as a rule, privately, it would be unwise to regard this as sufficient to cover all the principles of memory drawing.

"Another modern method—that of co-ordinating drawing with the rest of a curriculum—is very properly gaining ground in all sections of educational work, from the lowest to the highest. It is a logical consequence of the new acceptance of drawing as a means both of recording fact and expressing visionary idea. Science has employed art little enough in the past in scholastic spheres. Now, however, once the start has been made, there is no danger of the great contributory value of drawing to the study of botany, for example, being overlooked. Although mechanics have always been indissolubly connected with drawing, there is yet room in chemistry, physics, and even history and geography for a greater use by students of its illustrative powers.

"Yet another modern idea in art instruction is that of training the youthful mind to the appreciation of art properly so called. There are many enthusiasts expending much energy and eloquence in an attempt to reveal the treasures of artistic beauty to children. Copies of famous pictures are imported into classrooms, and disquisitions into their merits are sometimes undertaken as a means of culture for the juvenile mind. One finds Vandyke, Turner, Rossetti, Velasquez, and a host of others, employed in this scheme of generating the love of art.

"There are great and famous story-pictures which even children can understand, but I am not one of those who possess an enthusiastic faith in the benefit of expounding the more abstruse forms of fine art to children; for I believe that the appeal of fine composition, æsthetic charm, and great artistic personality is beyond their appreciation. To understand really great imaginative art like that of Rossetti or Turner demands some maturity of the intelligence, and very frequently in the case of artists like Rossetti some experience of emotions which children have never felt. There is, on the other hand, everything to be said for the practice of surrounding children, and for that matter adults also, with beautiful works of art, abstruse or otherwise, hoping for the influence which their beauty will silently and inevitably exert; but I would not strain the immature faculties of children towards any self-conscious attempts at appreciation. I conceive it very much wiser to lay an intelligent foundation upon which this type of culture may properly be built with advancing years.

"And how, you may ask, is this foundation to be laid? I would reply that it may be done by teaching all who have to be taught the elementary or higher forms of art, respect for, and, as far as possible, accomplishment in, three things—truthful representation, good workmanship, and the power of memory or invention.

"With regard to truthful representation, the modern idea of drawings from actual things, especially natural things, will fulfil its purposes. If, when a drawing is made, the closest observation be directed towards structure, and, whenever possible, the *reasons* for it, whether in a natural or other form, one great aspect of truth will reveal itself. One might go so far as to maintain that it is impossible to make an intelligent drawing of anything without this preliminary analysis and understanding of structure. And the same may be said of all other facts of colour, texture, and general character that go to make up the visible aspect of the thing. Following upon this, memory drawing will gauge the amount of truth absorbed.

"With regard to good workmanship, no age is too early for an *attempt* at it. I do not say that no age is too early for its accomplishment. As a matter of fact, accomplishment cannot come early. There is, however, a danger that attends some modern ideas, more especially in teaching elementary drawing, of a reckless disregard of any sort of accomplishment at all. So long as the child or youth is busily occupied with the spontaneous delight of drawing, he or she may commit almost any kind of artistic—or inartistic—enormity, and it is overlooked because of the fresh and undisciplined impulse behind it. Too much of that sort of liberty will leave the last state of elementary art education worse than the first. There are laws, like the laws of perspective, for instance, which by common consent of all artists are the best to follow in order to obtain certain effects of representation. It would be folly to throw away the accumulated experience of generations of artists and cause each child or each student to grope in darkness when plenty of light and leading is available. I would apologise for saying anything so trite if I had not heard it seriously advanced more than once that laws or methods are always very much better left to the scholar to invent. I am myself a fervent upholder of the doctrine of encouraging personal effort in the scholar, and I do not think much of the teacher who stereotypes method and has an inflexible rule of procedure which every scholar or student must follow. Technical methods grow and evolve through experiment, new ones are always cropping up, the personal style is always manifesting itself. Yet, as I said before, there are certain laws of representation which do not alter, and the spectacle of a teacher holding back assistance from a scholar struggling to master these laws by himself, or contentedly going from bad to worse without them, is eminently ridiculous.

"In conclusion, may I say that the old idea that the ability to draw is a natural gift, and that only, is very properly exploded. Newer ideas recognise that up to an appreciably intelligent point any one may draw who is not physically or mentally defective. Beyond that point one may look for natural gifts and find them more often now, perhaps, than ever before. There will come a time, I believe, when to be unable to draw will be as contemptible as it is now to be unable to write or spell, if the modern ideas now arising grow to be universally recognised, as they seem to promise."

Mr. Henry Cadness, F.S.A.M., Art Master, Man-

chester Municipal School of Technology, in opening the discussion, said the subject treated so happily in the instructive papers they had just heard was in a rather chaotic state. Modern ideas had developed so rapidly as to have become quite bewildering. It was not until 1905 that drawing received official acknowledgment of its value as a factor in education, and even now it was generally given only about one hour per week. Speaking of Japanese brush drawing and colouring and elementary arrangement of patterns, Mr. Cadness said Mr. Carter had deprecated this as absurdly misplaced, saying that "it ought never to have found its way from schools of design—its proper sphere." He (Mr. Cadness) did not care to dogmatise in this way, and he would remind Mr. Carter that Dr. Kirchensteiner strongly advocates pattern-making as an exercise of the inventive side of the pupil's mind after experimenting with 58,000 children of ages from six to fourteen years.

Mr. J. Knight, headmaster, Bury School of Art, said his own interest at present lay with the elementary side of the question—with the enormous changes that have come about from the energetic efforts of certain Government inspectors; and he thought they were all feeling anxious as to how long the new methods would last, and what were likely to be the developments of the immediate future. Mr. Carter had treated with considerable delicacy such debatable points as the necessity of teaching principles, the value of demonstration by the teacher, and the importance of good workmanship. There was, he continued, special need for insistency on all these. He wished Mr. Carter had given his opinion on such technical methods as the use of coloured chalks and water colours by young children, the value of mass drawing, the abolition of copies, and the falseness of outline. Speaking of outline as another despised subject, Mr. Knight said he upheld, and would endeavour to obtain from students, a greater facility in drawing in outline. The exclusive use of coloured chalks and water colours (now so popular) tended to develop in practice a satisfaction with a superficial effort and a lack of precision which was fatal to progress, and which seemed to him the principal stumbling-block of modern methods. In conclusion, he would plead for more freedom of choice for individual teachers in primary and secondary schools, for the reinstatement of outline and, if need be, of copies, and generally for a combination of all that was good in the old system and much that is valuable and delightful in the new.

HONOURS PAGE.

THE awards this month go to—

1. H. Richardson (13), Mablethorpe Council School.
2. Harold Dent (13), Burnley Wood Council School.
3. G. Winstone (12), Park Road School, Kettering.
4. Campbell Kerr (13), John Street Public School, Glasgow.
5. Alexander M'Tavish (13), John Street Public School, Glasgow.
6. George Murray (11), Cathedral School, Great Charles Street, Birmingham.

All these were good black-and-white drawings except No. 2, which was in colour. Nos. 4 and 5 were specially distinguished by the excellent realisation of the texture of the material.

Commended.

Alicia Griffiths (14), Higher Elementary School, New Brighton.

Alfred Barker (13), Wesleyan Day School, Barnsley.

John W. Yates (12), Park Grove Council School, York.

William Boyer (13), Mantle Road Council School, Leicester.

C. Wilkins (13), Sulyard Street School, Lancaster.

Thomas Blakeley (13), Sulyard Street School, Lancaster.

Susan Smith (12), Boothferry Road School, Goole.

John Boyten (13), Clapham Road Council School, Bedford.

Rowland E. Dawes (9), St. Paul's School, Addlestone, Surrey.

Frank Bailey (11), St. Paul's School, Addlestone, Surrey.

Dennis Moore (11), St. Paul's School, Addlestone, Surrey.

Frank Ellis (11), St. Paul's School, Addlestone, Surrey.

Sydney Haylor (10), St. Paul's School, Addlestone, Surrey.

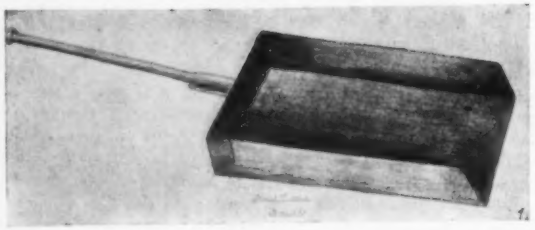
Rosalind Austin (11), Pelham Girls' School, Wimbledon.

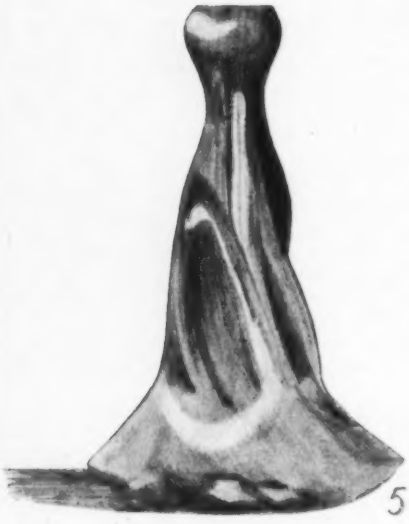
Next month we hope again to show some reproductions in colour. Good black-and-white drawing should, however, not be neglected. The number of drawings sent in since the beginning of the year has been rather below the average.

EDITORIAL NOTE.

THE special attention of our lady readers is directed to the article on "Needlecraft," by Miss Ann Macbeth and Miss Margaret Swanson. This is the first of a series which will deal with the cult of the needle from the earliest attempts of young children to the advanced work of adults. In future numbers some of the colour pages will be devoted to this section. Needlework, like drawing, arithmetic, and most other subjects of the primary school curriculum, was formerly taught merely for the sake of technique. A great amount of time has been spent on "specimens," which were, after examination, cast aside. This series of papers will show that, without neglecting a single necessary process in the art of needlework, simple, useful, and artistic articles can be made to take the place of those useless specimens. The children will gain educationally, and a great deal of the eye-strain caused by making small stitches with white cotton on white material will be avoided.

Miss Macbeth is one of the foremost craftswomen of the day, well known at home and abroad. It is gratifying to find so clever an exponent of the art of the needle turning her attention to the needs and necessities of primary and secondary schools. Miss Swanson is a practical teacher in a primary school; so that the requirements and capacities of the younger scholars will receive their full share of attention.





HONOURS PAGE.

DRAWING IN PUBLIC ELEMENTARY SCHOOLS, DENVER, COLORADO.

BY CHARLES M. CARTER, DIRECTOR.

SEVENTH YEAR.

THE "ideal cube" is presented in a manner similar to corresponding exercises of the sixth year. Following are points brought out:—

The outlines should show—(*a*) Convergence of retreating parallel edges; (*b*) the nearest vertical edge the longest, the farthest the shortest.

The shading should show—(*c*) The light side; (*d*) the half light side (top); (*e*) the shadow side; (*f*) the cast shadow; (*g*) the reflected light.

The following details should show—(*h*) The light side lightest near the front edge; (*i*) the top lightest near the front edge; (*j*) the shadow side darkest near the front edge; (*k*) the shadow side darker than the foreground and background, and lighter than the cast shadow; (*l*) the cast shadow darkest and sharpest near the cube; (*m*) the reflected light near the bottom of the shadow side; (*n*) sometimes a slight reflection of the light side in the foreground.

Surfaces struck by the light are represented by *white chalk;* those not struck, by *charcoal.* Half-light is represented by the *gray paper* or *blackboard* alone, or is either modified by charcoal or white chalk. Pupils invent drawings which embody these points. The results lead us to consider these exercises as among the most profitable.

In the autumn, nature work is continued as indicated by the illustrations of Plate I.

Another kind of exercise of particular value is connected with working drawings, and consists of making a plan of the schoolroom or an elevation of one of its

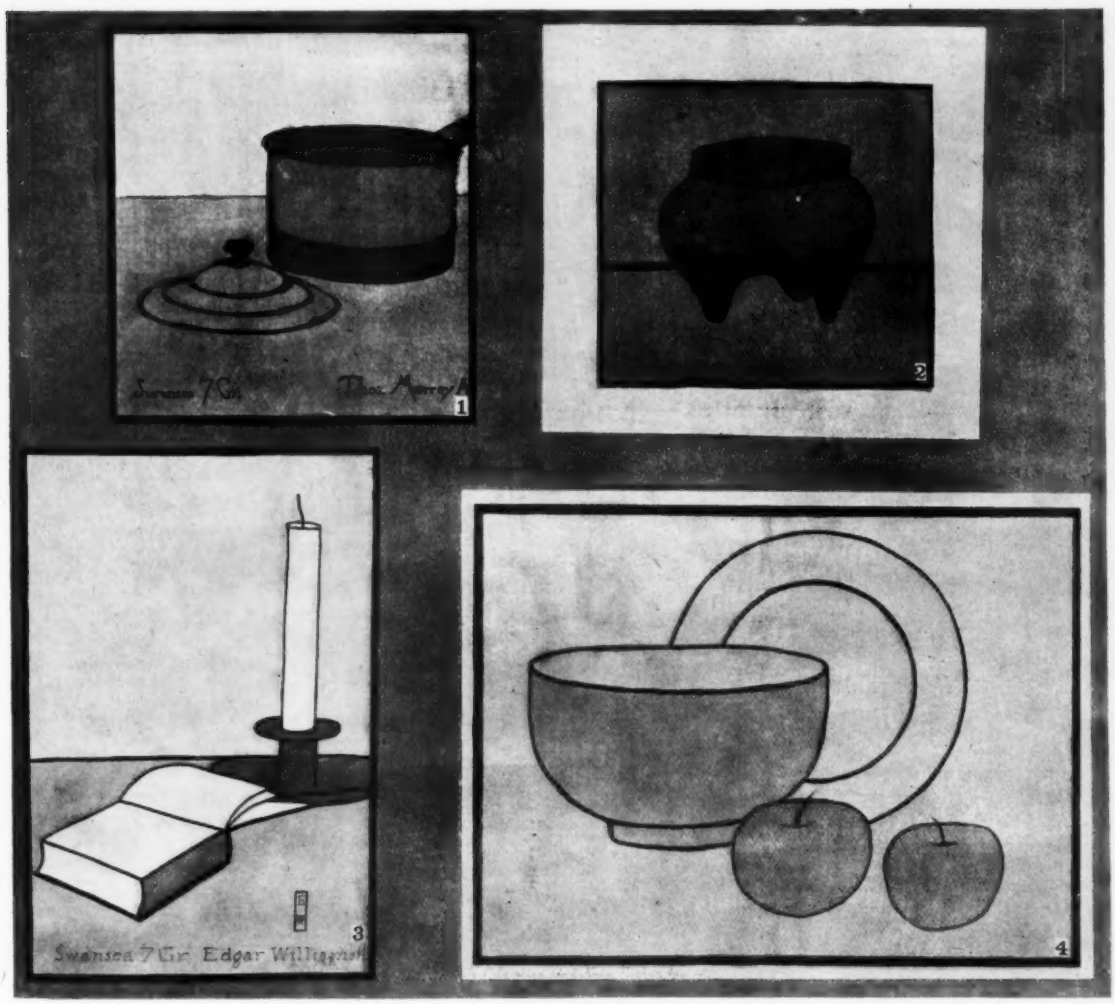


PLATE IV

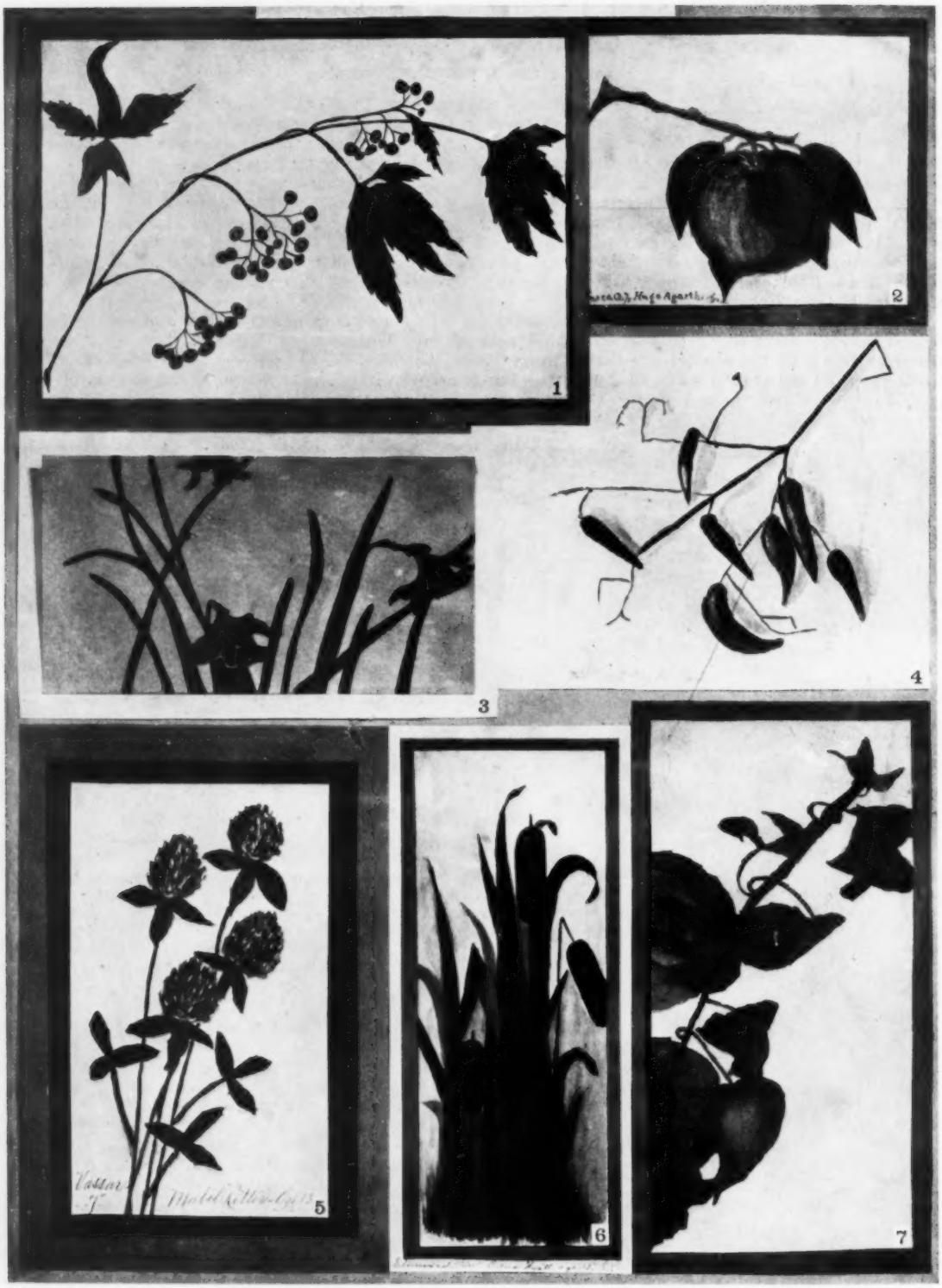


PLATE I.

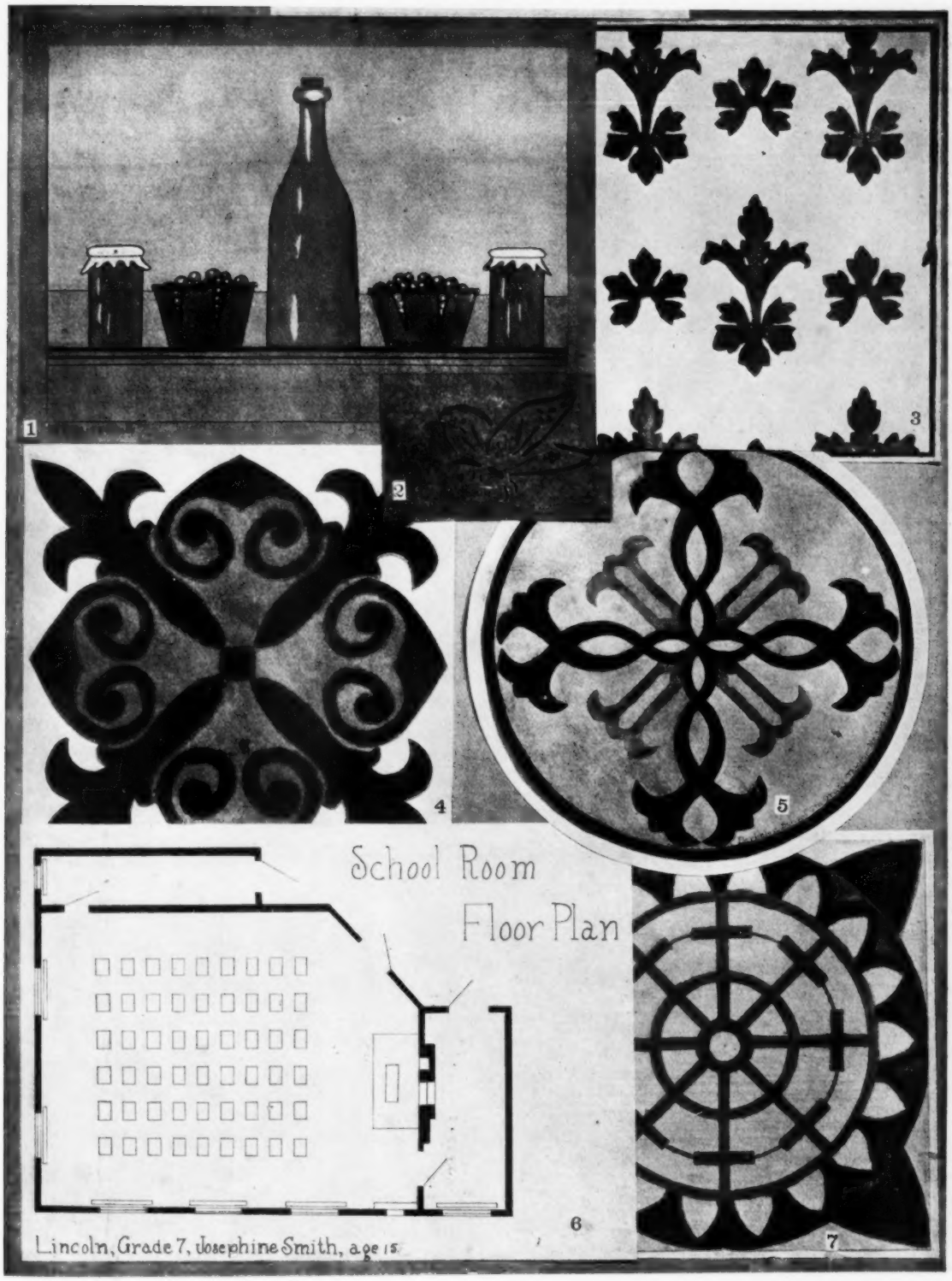

1
2
3
4
5
School Room
Floor Plan
6
7
Lincoln, Grade 7, Josephine Smith, age 15

PLATE II.

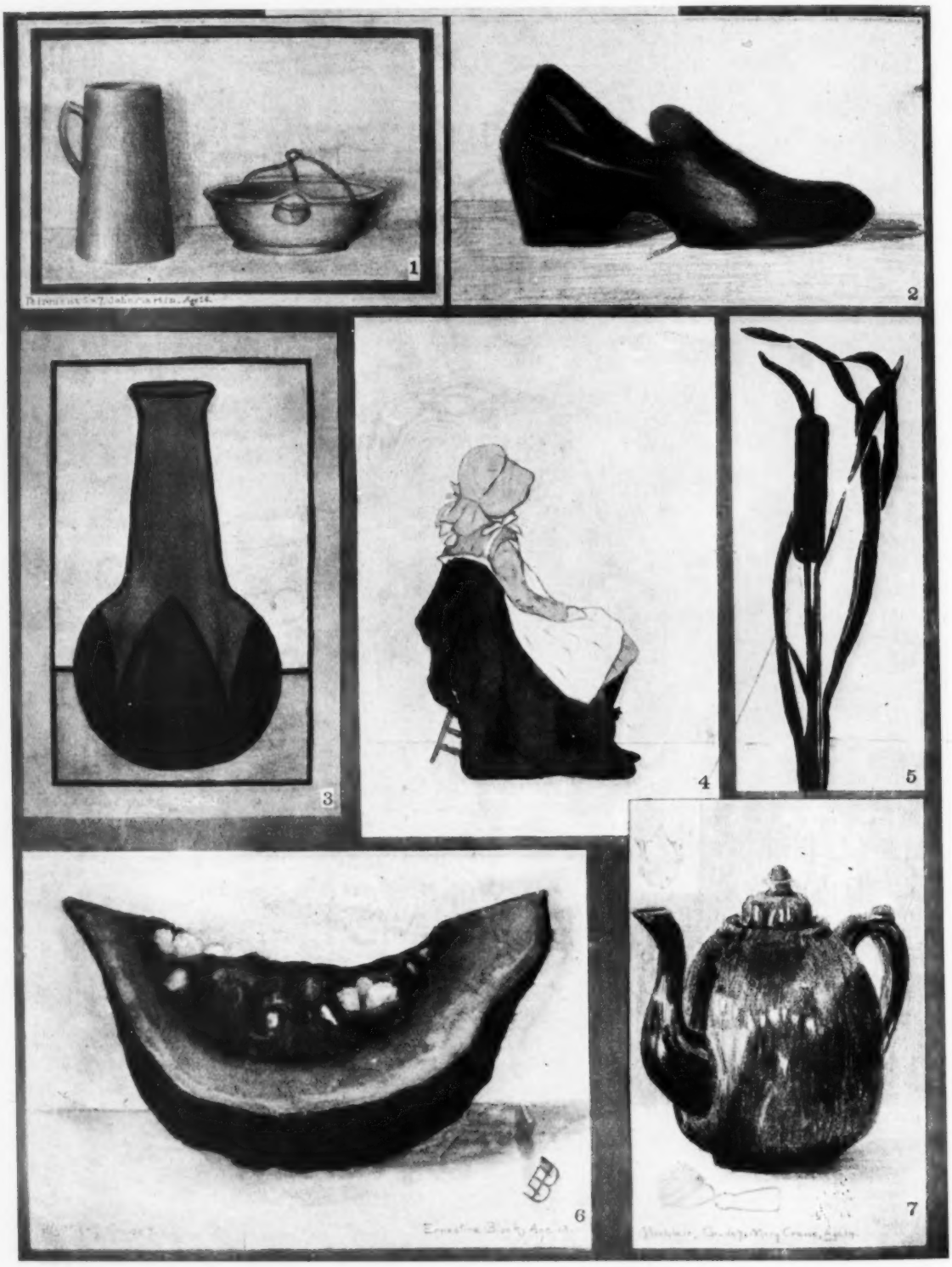


PLATE III.

sides. The drawings are on as large a scale as possible, as ½ inch = 1 foot. The plans are tinted with water colours to represent the different materials, as wood or brick. If an elevation is made, it is sometimes made the basis for an exercise in planning harmonious colours for the wall and woodwork. Particular attention is given to teaching the conventional ways of representing doors, windows, etc. (Fig. 6, Plate II.).

The work in designing is indicated in part by Plate II. The motives are derived from nature and historic ornament. Some attention is given to the Byzantine and Romanesque styles. Borders and radial designs constitute some of the work. In the autumn nature is the principal source of inspiration. In connection with "all-over" patterns stencils are sometimes used (Fig. 2, Plate II.). The decorative treatment of simple objects in flat colour is sometimes attempted (Fig. 1, Plate II.) In immediate connection with drawing, application of design is made to objects like notebooks, card receivers, etc. There are quite a variety of objects that may be made of cloth and cardboard that pupils are encouraged to construct at home. Occasionally an exercise is given in designing a "poster" related to school work, such as "Exhibition of Drawings." They are planned so as to embody features derived from plant form or historic ornament. Again, a particularly useful exercise consists of designing, constructing, and decorating a portfolio for the pupils' drawings.

Colour.—This is considered during the year in connection with the various exercises. It consists of a general review of the features of preceding years, also of analysis of acknowledged good combinations of colour, as shown in various objects—textiles, book-covers, wall-papers, historic ornament, etc. Complementary harmony is particularly considered.

Representing objects in various ways, by different mediums, is shown by Plates III. and IV.

DETAILS OF PLANT FORM AS AIDS TO BOTANY.

BY AGNES FARMAN, LEICESTER.

IN an article published in this magazine in November 1909, it was pointed out how closely related drawing and botany lessons should be, and how the teacher of drawing can help towards the proper understanding of botany diagrams and details without departing from the regular course of work.

Besides plans and sections of flowers, details common to all plants, but varying in their functions and growth, may be studied. An instance of this is the attachment of leaf-stalks to stems, a few specimens of which are given. Drawings of such special parts, from examples large enough to be valuable as drawing exercises, should make an exceedingly interesting series for any class which is learning both botany and drawing. This should, of course, be begun at a time when leaves and their attachments are being studied in the botany course; and the interest of making it as complete as possible will induce the pupils to search for and bring their own specimens, and will give a definite aim to the drawing lessons. Flowers or leafage drawn with no special object except that the lesson happens to be one on plant form have not the educational value of a series of the type suggested.

(*Continued on page 530.*)

FIG. 3.

COLOUR WORK IN SCHOOL.

DRAWING WITH CRAYONS.

BY J. YOUNG, GLASGOW HIGH SCHOOL.

THE examples which illustrate this article are all reproductions from crayon or pastel drawings. The crayon is a suitable medium for work in all classes of the school, and there is much to be said in its favour as an introductory medium for the study of colour. It is more restricted and limited than water colour, yet, on the whole, it is the safer medium in the hands of young children. The great recommendation for crayon drawing is the facility it gives for work on a neutral ground. The tinted paper on which most of the drawings are done provides a new point of reference in the search for colour and tone values. It is a useful and very welcome change from the usual shading exercise, where we generally work with the two extremes of the tone scale—that is, white paper and black pencil. A student who has already done some black-and-white shading experiences considerable difficulty with crayons, especially when working with the lighter colours. Young children will *match* a colour with ease; and if they are representing objects which are absolutely flat—such as a flag, kite, or label—the work goes smoothly, and a fair measure of success can be counted on. To appreciate the colour change on the rounded surface of an object, due to the influence of light, shade, or shadow, is a very difficult thing indeed, even for students who could render the rounded appearance perfectly in black-and-white.

It seems a tempting thing to have the children do their drawings of oranges and apples, etc., not with a black line on white paper, but with the natural colour and on a neutral ground, which in most cases would be more like the usual surroundings of the model. But when the attempt produced by the pupil turns out to be a circular daub of orange, or a red-and-green disc, to represent a thing which is full, solid, and round, occupying space and surrounded with atmosphere, one is apt to be discouraged, and wonder if it is not expecting too much from mere ordinary individuals—immature individuals at that. Of course a wise teacher will lead up to such exercises by taking a few coloured objects of two dimensions only, such as a banner or shield form, then a book or box, in which the third dimension is slight, yet decided enough to be easily observed and drawn. Fruit, leaves, etc., with surfaces that are infinitely and subtly varied, must be left till some experience has been gained in representing the easy flat things mentioned—such regular rounded surfaces as balls of coloured wool and some cylindrical common objects or vases. The introduction of new difficulties must be very jealously watched, and the lesson of colour change due to light is one which will take long to learn.

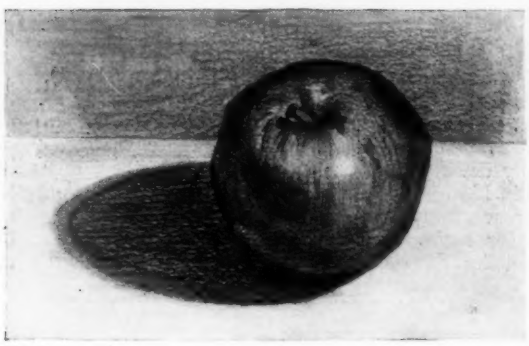
It is absolutely necessary to form a definite plan, deciding the nature and extent of the work to be attempted. Those who are making a beginning will have doubts as to what to do, as well as how it should be done.

The writer finds from experience that the equipment should be simple, the exercises should be easy at the beginning, and the graded steps very carefully and gently increased in difficulty as the work proceeds. A box of, say, nine or twelve crayons is ample for the work that can be attempted in the ordinary elementary school. The paper may be ordinary brown packing paper, or the cheap tinted papers which are now sold for this special purpose.

The secret of success in the manipulation of the materials is gentleness and delicacy. Work up to the final result gradually; do not force anything. Mere muscular strength is seldom, very seldom, of service in any kind of art work. There must be no rubbers used. Errors should be honest ones, then no one need be ashamed of them; and the method of correction in crayon work is rubbing in, not rubbing out. I mean that if an error is made in drawing, it should be a mere faint line which the subsequent shading will cover and absorb as the work proceeds. Begin at once with the crayon. There should be no preliminary pencil drawing. Sketch lightly the general lines, showing proportion and planning without detail; then start at the top, putting in a slight shading to represent the tone and colour of the background, if the tinted paper does not already fully represent it. When you approach the outlines of the object, select crayons which will give you the correct colour and tone contrast between the background and the top of the object. Lay in these colours as near the truth as you possibly can, and proceed downwards in the same method, until the whole general effect is complete; then go back, altering and elaborating until all the detail is finished. Remember that the pores of the paper will carry only a certain amount of chalk. When they get filled up and clogged, it is difficult to further mix and blend one colour into another; therefore leave strong, decisive touches until the last. Do not be in too great a hurry to get the full strength of colour, and try to get a richer effect by lightly blending several tints for what at first seems a flat and equal surface. Of course the timid ones may want advice which is the opposite of all this; but, after all, they are few as compared with the many who spoil their work in a few seconds by hastily scrubbing on the chalk without the least thought or care, and get their drawings in an absolutely hopeless condition. Preliminary exercises in covering comparatively small plane surfaces, such as squares, circles, etc., with flat tones are very useful to teach the mechanical use of the chalk. Only careful, deliberate, delicate handling can produce good results.

The coloured illustrations represent a variety of work. Fig. 1 is an infant child's attempt to represent an orange. Note that even this child has given in some measure the form, colour, and the light and shade. It is interesting to compare this drawing with No. 6, which is the representation of an apple by a much older pupil. Here *all* the conditions which influence the appearance of an object have been carefully observed, considered, and rendered. The first two drawings on the plate are done with ordinary chalk crayons, one on white and the other on brown paper. No. 3 is a drawing done on very dark paper with three Conté crayon pencils—black, sanguine, and white.

The other three drawings are done on ordinary white drawing paper with the coloured pencils known as Creta Lævis. These pencils blend very well, and admit of finer detail work being done than is possible with the chalk. These drawings are also comparatively permanent, and safe from rubbing without being fixed in any way. This is, of course, a drawback for the crayon drawing when a very large number require to be fixed in order to preserve them with their original freshness.



COLOUR WORK IN SCHOOL.

The development of the flower and seed of individual plants makes another attractive set of exercises by which the botany should benefit if the work is intelligently carried through and memorised; for these drawings will require precisely that patient search for detail which is so much needed in the study of botany. The crown imperial lily on page 531 shows three such examples, and a series of this kind could be carried on all through the summer. There is a tendency in drawing classes to allow flower work to monopolise the summer months, and to reserve seed-vessels for the autumn and winter work; but this is a mistake. Many beautiful seed-forms appear quite early, and in some cases are even better for drawing purposes than flowers. By April the little pods of the aconite are fully grown,

Fig. 1.

though still surrounded by their collar of green (Fig. 1), and from this time onwards seeds follow as rapidly as flowers. More often than not in the case of flowers which grow up the stems one above another, the seeds are fully developed on the lower part while the flower is still in blossom on the upper, as in the honesty (Fig. 2), foxglove, hollyhock, and others.

Another series may group the different positions assumed by flowers and fruits into those which are upright or pendent, or in which the seed-vessels of hanging flowers take an almost erect position as they ripen, as the foxglove (Fig. 3, page 527), the crown imperial lily, snapdragon, cowslip, etc. The knowledge gained by such systematic work is bound to tell in the long run, whether it be required for immediate use or not.

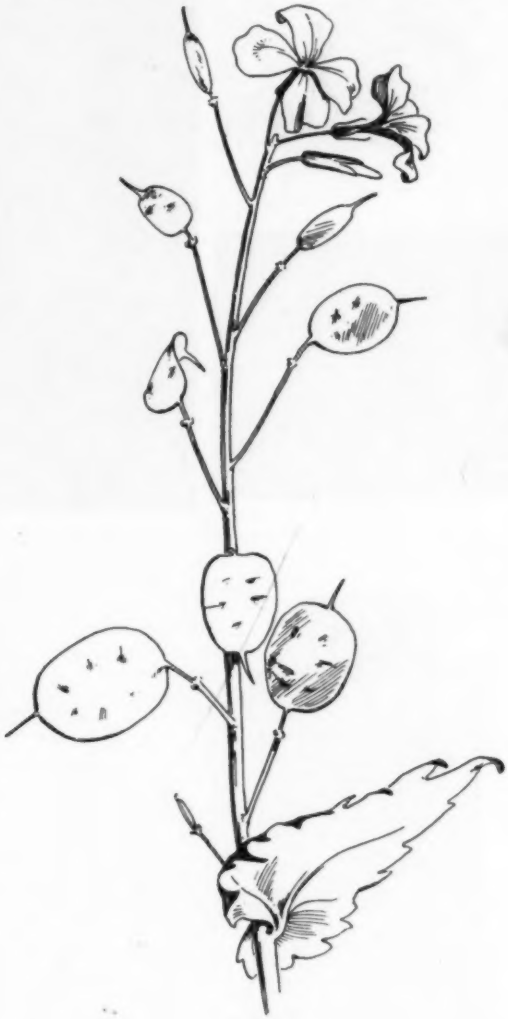
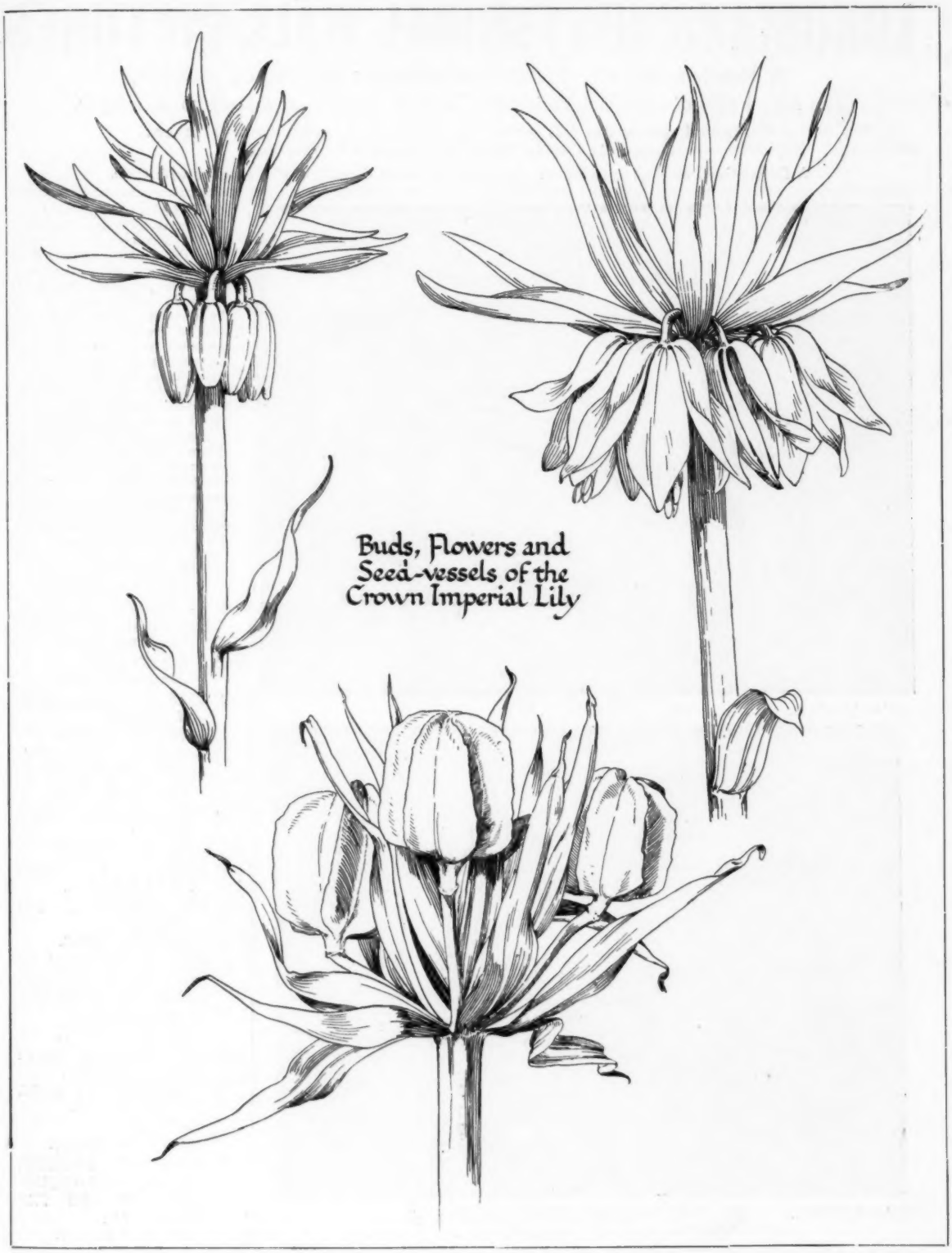


Fig. 2.

In schools where modelling is taken, further opportunity is afforded of imparting definite knowledge by repeating any of the forms that are suitable in relief, such, for instance, as the iris leaf or the seeds of the lily represented on page 531. The time for such exercises is, however, often limited; therefore care is needed to place the examples chosen in possible positions, and to select those which can be executed in reasonable time.



DETAILS OF PLANT FORM AS AIDS TO BOTANY.

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NOTES AND SUGGESTIONS ON THE TEACHING OF EXPERIMENTAL SCIENCE, MATHEMATICS, AND DRAWING.

BY C. HAMILTON.

(*Continued from page 463.*)

Section XXVIII.

THE only further topic which has any claim to be included in a preliminary course in heat is calorimetry. So essential is this to correct notions of energy at a later stage that considerable care ought to be exercised in directing the teaching towards the proper end. In this, as in some other parts of the course, the main aim is a clear, comprehensive grasp of the relations between temperature, quantity, and capacity for heat. Most of the experiments upon which our broader conceptions of thermal quantities are based are beyond the range of elementary students; the only quantities they can determine are the capacities of a few substances for heat in comparison with that of a standard substance, such as water.

It is suggested, therefore, that little or no time should be spent over the mixing of hot and cold water, and that the meaning of the term "thermal unit" should be stated boldly. For when the students have reached a certain point it is easier for them to grasp and use a comprehensive truth or authority than to draw conclusions from a multitude of simple experiments which give only moderately satisfactory results.

A few calculations involving the British thermal unit and the calorie should be worked before proceeding further.

Probably no experiment in the whole range of practical physics indicates adherence to tradition to a greater degree than do experiments in specific heat. If some text-book suggests one precaution and omits any reference to another, an experiment is stereotyped, and few think of altering it in detail. Thus one finds highly polished calorimeters in use in schools which do not possess a thermometer graduated more finely than to 1° C.; while, as a matter of fact, the difference in the amount of radiation from one of these calorimeters and a quarter-pound cocoa-tin is, in the hands of the average student, inappreciable.

A thermometer divided in $\frac{1}{5}$° C. is of immense value in specific heat determinations, because the rise of temperature is usually so small. The chief difficulty lies in determining the instantaneous temperature—that is, the temperature which would have been reached had there been no cooling by radiation, etc. With a good class the following plan may be adopted: The temperature is noted at half-minute intervals for two or three minutes after the hot body has been immersed. The temperatures are then plotted vertically, and the times horizontally, on squared paper. The line joining the points forms the cooling curve, and if produced backwards it cuts the vertical line from the point "0 minutes" at a height corresponding to the instantaneous temperature. After working out their results, and a few exercises, the students should write the formula connecting the heat lost and the heat gained. This formula is complicated in some text-books by an unnecessarily large number of symbols. With weak students the fewest possible symbols should be used.

Specific heat is of little industrial importance, but the effect of the high specific heat of water on the climate of islands and continental coasts ought to receive something more than a passing mention.

On the other hand, latent heat has many applications, both in industry and in daily life. The method of determining this constant calls for no comment, save the warning that students should not imagine water to be the only substance which possesses this property.

In regard to applications, comparison may be made of steam and hot water for heating purposes, and of the use of salt in clearing streets of snow. There are several striking experiments, exhibiting the cooling of a liquid by evaporation, which should be shown.

Examples.

1. Find the number of units of heat required to raise 17 gm. of water from ·5° C. to 25·6° C.
2. Find the amount of heat given out by 48 gm. of water in cooling from 78° F. to 37° F.
3. Find the amount of heat required to raise 10 lbs. of water from freezing point to boiling point in Fahrenheit units.
4. Calculate the quantity of heat required to raise 30 gm. of copper (sp. ht., ·094) from 15° C. to 40° C.
5. Calculate the amount of heat that will be given out by 150 gm. of iron (sp. ht., ·112) in cooling from 460° C. to 20° C.
6. Find the amount of heat required to raise 2 kg. of copper from 20° C. to its melting point, 1,080° C.
7. Find the amount of heat given out by 1 kg. of the following metals in cooling from their melting points to 15° C.:—

   Lead, m.p., 326° C.; sp. ht., ·032.
   Tin, m.p., 230° C.; sp. ht., ·056.
   Iron, m.p., 1,300° C.; sp. ht., ·112.

8. 122·5 gm. of brass at 70° C. were immersed in 120 gm. of water at 20° C. The final temperature was 22·5° C. Find the sp. ht. of brass.
9. A piece of iron weighing 35 lbs. is dropped into 4 gallons of water at 15° C. What will be the final temperature?
10. How much heat is required to convert 10 gm. of ice at 0° C. into water at 15° C.?
11. How much heat is required to convert 15 gm. of ice at 0° C. into steam at 100° C.?
12. Suppose steam is used for heating a building, and that in keeping the pipes at 100° C. 10 per cent. of the steam is condensed to water at 100° C. How much heat is given up to the pipes per lb. of steam?
13. What weight of steam at 100° C. would be required to raise one litre of water from 0° C. to 100° C.?
14. If m gm. of a substance of specific heat s falls through t° C., how much heat is evolved?
15. If the heat in Example 14 is communicated to M gm. of water originally at temperature t_1° C., write a formula which would enable you to calculate the specific heat of the substance.
16. If L is the latent heat of vaporisation of water, write a formula for the amount of heat given out by m gm. of steam at 100° when condensed into water at t° C.
17. If the m gm. of steam in Example 16 are passed into M gm. of water at t_1°, write a formula by which you could calculate the latent heat of vaporisation.
18. If L is the latent heat of fusion of ice, and m gm. of ice at 0° are converted into water at t° C., how much heat is absorbed?
19. If the heat in Example 18 comes from M gm. of water at t_1° C., write a formula by which you could calculate the latent heat of fusion.

Section XXIX.

As it is not found possible in many cases to deal with chemistry in the preliminary technical course, it is not proposed to deal very fully with this subject. At the same time, where accommodation exists, it is very desirable that the chemistry of air, the meaning of combustion, and a few other matters should be included. The ordinary school course of chemistry proceeds very slowly, and the early portions contain but little that is of value to technical students. An attempt will be made, therefore, to indicate the lines upon which the work may proceed.

In Section XXIII. the class discovered that the changes produced in bodies by the action of heat were of two kinds—temporary and permanent. The temporary changes have been investigated in Sections XXIII. to XXVIII., and the aim is now to inquire into the permanent changes.

It is unfortunate that in evening schools the students are sometimes found to have some knowledge of the subject, because the teaching of chemistry in elementary schools is rarely carried on under circumstances which permit of inductive treatment. The common statement, however, that the students have much to unlearn is hardly so important a difficulty as it is made out to be; for if they have been taught by a defective method, a little smart cross-questioning will soon reduce them to a suitable and proper spirit of docility. It is a queer sort of boy who, finding that he knows less than he thought he did, does not desire to recover his reputation. Of course, the first step is always to revise, correct, and extend existing impressions.

Assuming no knowledge whatever, the experiments of Section XXIII. may be recalled, and the class asked whether metals always require to be heated in order to undergo change. This will direct attention to the rusting of iron and the tarnishing of metals generally. The fact that when iron rusts, or when iron, copper, zinc, magnesium, etc., are heated, an alteration takes place in appearance, suggests that other properties may have altered. What other properties are there? (Weight, density, etc.) Let different members of the class try the effect of varying temperature and duration.

Now, if all these changes involve an increase in weight, what is the cause? Having obtained the suggestion that the increase comes from the air, ask for proposals to find out whether this is so.

In the course of the discussion it may be pointed out that experiments should be performed in which air is excluded. Thus, zinc and magnesium should be heated under sand or borax as well as in air.

The class should, as a result of their experiments, be able to state—

1. That air is necessary for the change.
2. That the substance increases in weight.
3. That the air decreases in volume.

And, therefore, that the change consists in the union of the metal with some of the air to form a new and non-metallic substance.

The next step is to find out whether there is any limit to the amount of air which a given weight of metal can take up. To test this, several experiments should be set up; and it may be noted that, when iron filings in dishes or muslin bags are enclosed with air, the same proportion of air disappears.

To finally clinch the matter, a substance which burns more readily in air (phosphorus) may be used, and the volume of the residual gas measured.

The class should now be able to state that certain bodies which burn in air increase in weight and remove one-fifth of the volume of air.

It may be noted in passing that there may be certain objections to the rusting of iron as an example, because recent investigations have shown that the process is extremely complex. But the investigation does not aim at the composition of rust, or at the mechanism of the process. It is a common mistake in the teaching of elementary chemistry that the aim of the lesson is obscured by insistence on secondary and more or less irrelevant phenomena, and the students consequently fail to acquire their facts in true perspective. The first essential is to build up a clear and simple framework of salient facts *in their true relation*, and subsequently to fill in the details which are necessary to the completeness of the structure. In the present case it is sufficient that air is necessary and that oxygen is removed, and these facts only are necessary for an elementary study of combustion.

Suggestions should be solicited as to the gas left behind after burning. What are its properties? Will things burn in it? and so on.

As the students know how nitrogen *can* be prepared, the usual operations may now be performed on quantities which, for his own convenience, the teacher has prepared in another way. There is no need to explain this process to the class in a short course, and in the absence of much anticipatory explanation the name ammonium nitrite would be a meaningless jargon.

EXAMPLES.

1. If a quantity of iron filings were left to rust in a litre of air what would be the final volume of the air?
2. If a quantity of tin is heated for a long time in two litres of air, what would be the final volume of the air?
3. If a litre of air weighs 1·293 gm., what would be the increase of weight of the iron and the tin in Examples 1 and 2?
4. It has been found that 64 gm. of copper when heated for a long time in air produce 80 parts of a black compound. What weight of nitrogen will have been formed in this process?
5. What is the percentage of copper in the black substance in Example 4?

Section XXX.

The aim of this section is to endeavour to isolate the constituent of the air which is concerned in the changes studied in the last section.

The class should be asked to make suggestions for the recovery of the substance which disappeared in the process of burning. The proposals should be followed up by asking what kind of apparatus will be necessary.

Heating one of the products of the combustions will most likely be the answer. There seems to be an inherent opinion in the minds of beginners that you can get any result you like with a substance by heating it. One would have thought that if a substance was produced by burning, the last agency in the world to effect decomposition would be heat. In the case of more advanced students than we are now dealing with, this attitude of mind is indicative of bad teaching; but with beginners it is justified by the fact that at this stage heat is the only agency with which they are familiar.

The suggestion to heat one of the substances must be followed up by requesting the students to make a selection. There is no reason why every student should use the same substance, so long as they ultimately share in the common discovery. This freedom of choice, and a communal system of working, destroy artificiality and make the work more real. The students are less likely to think that, after all, they are only following a cut-and-dried plan; and this must be avoided at all cost. It does not matter very much whether they solve the problem through red lead or mercuric oxide. If Lavoisier's experiment has been described in the previous lesson, or if the actual experiment has been set going, mercuric oxide may be one of the substances chosen for experiment.

The isolation of oxygen having been effected, the properties of the gas may be demonstrated, and sulphur, phosphorus, charcoal, iron, magnesium, and sodium should be burnt in it. The gas for this purpose may be

obtained from any source—the various methods of preparation are not germane to the investigation. The name "oxide" should be given to the products.

The oxides may now be classified into metallic and non-metallic. It should be shown that these, when soluble, give definite reactions with litmus solution, and that when solutions are mixed in certain proportions no reaction with litmus is observable at all. Hence the names alkaline and acid should be given. It is important to note that when a basic oxide is soluble it is alkaline. Thus magnesium oxide, which is only soluble to the extent of 1 part in 55,000 parts of water, gives the alkaline reaction when dropped on a piece of moist red litmus paper and then washed off.

Solution and suspension will most likely have been dealt with under heat; and the class may understand that when an alkali and an acid have neutralised each other, the resulting body may be recovered by evaporation. An explanation may therefore be given of the word "salt."

The fact that the oxidation of metals proceeds slowly at ordinary temperatures may be recalled, and the various methods of preserving materials by paint, grease, galvanising, tinning, lacquering, and oxidising may be given.

The symbols for the various elements may be given in this section, and their use explained as a system of shorthand. It must be remembered that this is a "short" course, and the student, without necessarily learning any more chemistry, will desire to read books whose authors have no qualms of conscience in regard to symbols and formulæ, and who may be quite proud of their ability to use them. Objections which have been raised in recent years to the early introduction of the symbolic representation of composition and reaction have been directed rather to its abuse than to its use.

EXAMPLES.

1. The composition of air by volume is 20·96 per cent. of oxygen and 79·04 per cent. of nitrogen. What is the weight of each gas in 7½ litres of air? One litre of air weighs 1·293 gm.
2. If 684 gm. of red lead are formed from 620 gm. of lead, what are the percentages of lead and oxygen in the compound?
3. How much lead would be required to make 1 cwt. of red lead?
4. How much lead could be obtained from 150 gm. of red lead?
5. If 200 gm. of mercury can be obtained from 216 gm. of mercuric oxide, how many gms. of mercury could be obtained from 320 gm. of the oxide?
6. A litre of oxygen weighs 1·433 gm. What volume of oxygen could be obtained from 216 gm. of mercuric oxide?

Section XXXI.

The object of this section is a further study of the oxides for the purpose of obtaining familiarity with certain chemical changes which are of industrial importance.

The teacher may proceed somewhat in the following manner:—

Referring to the attempts to isolate oxygen, it was noticed that some gave up the gas readily and others did not. Which did not? (MgO, ZnO.) Which did? (Pb_3O_4, HgO.) Did you notice any difference in the readiness or vigour with which the different substances combined with oxygen? Would it not be possible to use one of these substances for removing the oxygen from one of the metallic oxides? What substance and what oxide would you suggest? (S and C—P is dangerous—with PbO, ZnO, and HgO.)

In the discussion of the results, the possibility of one of the non-metals having combined with the metal should be suggested. The formation of SO_2 will be detected by smell, and the metal will not be obtained. An alternative plan is to ascertain first whether C or S combines with the metals themselves.

If the metal does combine with sulphur, how could the sulphur be removed? The students, remembering that sulphur burns vigorously in oxygen, may suggest that a stream of air passed over the hot sulphide will remove the sulphur. This experiment should be carried out.

It has been found that C will reduce all the oxides examined except MgO. Why? Is MgO more stable than CO_2? If so, would Mg decompose CO_2? Try. Note the formation of white powder and black specks.

The work of the section may be summarised by the students as follows:—

1. A substance that combines vigorously with oxygen may be employed to remove oxygen from an oxide.
2. Certain metallic oxides (name) are "reduced" to the metallic state by heating with carbon.
3. Metallic sulphides heated in a current of air appear to be converted into oxides, the oxygen combining with both the sulphur and the metal.
4. Carbon forms one of the most stable oxides, being decomposed only by magnesium.

At this point the teacher may describe the forms and occurrence of carbon in nature, and show how it is produced from wood, sugar, turpentine, bones, etc.

The origin of coal should be briefly described, and the formation of coal-gas by distillation from a clay pipe may be illustrated. If a visit to a gas-works can be arranged, the students should know before they go that the coal when heated out of contact with air forms gas, watery liquor, oils, tar, and coke.

The use of coke for obtaining metals from their ores should be described. It may be explained that many metals occur naturally as sulphides or oxides. In the former case, they are "roasted" in a current of air before being "reduced" by carbon. The use of coal-gas for giving light and heat, and its employment in gas-engines, should be noted. Reference should be made to the extent to which carbon dioxide is being formed.

In this section the writer has had in view mainly the needs of students engaged in the metal trades, and some modification might be considered desirable for others engaged in building. In that case the teacher would probably elect to deal rather fully with the composition of limestone, and with CO_2 and the carbonates generally. Most teachers would include a section on the composition of water, and would discuss the suitability of various kinds of water for industrial purposes at greater length than with schoolboys. Wherever students engaged in occupations involving similar materials and processes can be grouped together, there are endless opportunities of working out special schemes; but the discussion of these is precluded by the necessity of drawing these articles to a close.

SPECIAL NOTICE.

THE Publishers still have a few copies of the Questions which appeared as a Supplement to the issue of *The Practical Teacher* for October 1909. Price 3d. each, or 2s. 6d. per dozen. Post free.

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The Editor's Bookshelf.

A NOTABLE SERIES.

A FEW weeks ago I paid a visit to a polling booth to record a vote for a party which shall be nameless. This important ceremony took place in one of the London County Council schools, and as I waited my turn I scanned the pictures which adorned the walls.

I say "adorned," and mean it. When I had the pleasure and privilege of teaching with the voice, as I now try to teach with the pen, I was forced to rely for pictorial illustrations upon the obliging proprietor of pills or mustard, and the name of a useful commodity continually obtruded itself "between the wind and my nobility," so to speak. In other words, the grandeur of the Aletsch Glacier was dimmed by an exhortation to personal cleanliness, or the heroism of a golden deed by a reminder that life would be unbearable without somebody's extract of war-worn chargers.

Nowadays nothing is too good—or, shall I say, good enough—for the school wall and the school book. And this is right; only the best is good for the children. And this, it is evident, is the opinion of Messrs. Longmans, who send me this month a series of *Historical Pictures* which I hope will soon adorn the walls of schools under the London County Council and elsewhere.

It was a difficult task to undertake—to present pictorially in a chronological series some of the outstanding events in English history. A series such as this must, so far as it goes, be complete in itself, giving the first notion of time and continuity. Here is a list of the subjects, from which my readers can judge for themselves how the work of selection has been performed: (1) The Roman Wall; (2) Augustine preaching before Ethelbert; (3) A Danish Raid; (4) Harold's Last Stand at Senlac; (5) Richard Cœur de Lion's Sight of Jerusalem; (6) King John seals the Great Charter; (7) Henry V. at Agincourt; (8) The Armada in the Channel; (9) Charles I. and the Five Members; (10) Wolfe on the Plains of Abraham; (11) Trafalgar; (12) Portsmouth Harbour in 1909—the *Dreadnought* and the *Victory*. I think that any teacher possessed of a moderate amount of imagination could tell our island story very well indeed from this material, though I should thank Messrs. Longmans for one or two more pictures on the reign of Queen Victoria, as well as a good Waterloo subject.

The publishers did well to place the work in the hands of such an accomplished craftsman as Mr. H. J. Ford, who annually delights us in the pages of Mr. Andrew Lang's Rainbow Series of Fairy Books. They have thus ensured carefulness of treatment as well as attention to historic truth and probability, and have also avoided that crudity of colour which offends the eye in many pictures of this character. The subjects are well composed, and the figures stand out, on the whole, with all the clearness necessary for class teaching. A particularly good example for school purposes is Mr. Ford's "Death of Wolfe," in which full advantage is taken of the brilliant scarlet worn by the British troops of the period.

After the artist has done his best, it is fatally easy for the colour printer to render all his efforts useless, and harrow his artistic soul to the same degree that Ruskin was moved by the shriek of a locomotive. Messrs. Longmans' series stands the test very well indeed, partly because care has been taken to print upon a very stout card with an excellent surface.

I have seen other series of historical pictures, and in contemplative mood have amused myself with wondering what they were intended to convey. On the whole Mr. Ford's pictures tell their own tale, so that he who runs (as we all do nowadays) may read. But lest the critic should grow humorous, the publishers provide a pamphlet containing helpful comments upon each picture. Here are two extracts from this small booklet:—

A Danish Raid.—The picture represents a fleet of Danish pirates sailing in the early morning up a creek on the east coast of England. The Danes are disembarking hastily to attack a Saxon village, the inhabitants of which are turning out for resistance. The invaders are armed with spear and battle-axe, and carry round shields. They wear "byrnies"—that is, coats of mail either of ring or scale mail. These were made by sewing rings or scales of iron over a tunic of linen or leather. Chain mail—that is, interlaced rings of metal—was also used by them. The helmets were sometimes adorned with crests representing animals or birds. The great prows of their warships were carved into the shapes of dragons, serpents, bulls, and other animals, and often elaborately gilded and painted. All through the ninth century the Danes assailed the coasts with constant raids, and in spite of the bitterest warfare they settled down and finally amalgamated with the English inhabitants.

In Portsmouth Harbour, 1909—the "Dreadnought" and the "Victory."—We are now taken in this series of pictures to our own century, and as illustrative of the progress of England's power, a *Dreadnought* is shown—the latest development in warships. As she steams past the old *Victory* in Portsmouth Harbour a comparison can be made between the modern giant and the old-fashioned line-of-battle ship which won our naval supremacy over a hundred years ago. Nelson's old flagship lies at rest in the harbour, rigged with jury-masts; for many years a training-ship for young sailors, now chiefly used for courts-martial: an interesting relic of bygone victories. The *Dreadnought* here represented has already many sister ships mightier than herself. In the right-hand corner of the picture we see a submarine—possibly the most important factor in modern naval warfare, and certainly the latest development in naval science—accompanying the *Dreadnought* as she steams out of the harbour.

This is a notable venture on the part of Messrs. Longmans. The series has been well planned and well executed. I think that my readers will show their appreciation, when opportunity arises, in the most tangible manner.

School Gardening. By W. Francis Rankine. 124 pp. *Pitman.*

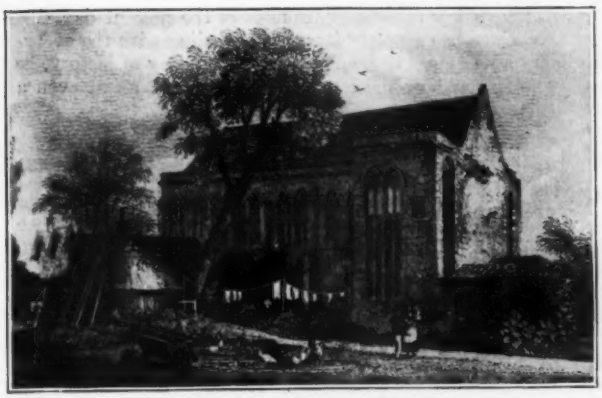
Both teachers and scholars should derive much useful information and guidance from this little book. It is evidently the work of an expert. The illustrations and hints are excellent. We consider that it would be just the book to place in the hands of a boy, who had already some knowledge of the subject, on his leaving school.

The Correlated Arithmetic. Teachers' Edition. Book IV. By T. W. Trought, B.A. Pitman.

This is the answer book to Part IV. of the publishers' "Correlated Arithmetic," and contains on one side the matter of the pupils' edition, and on the other the answers, oral questions, notes, etc. The exercises are generally somewhat difficult for the age of the pupils.

The Proper Use of Local History.

HOW A PRACTICAL TEACHER HAS SOLVED AN IMPORTANT PROBLEM OF METHOD.



EXTERIOR OF ELTHAM PALACE.
(*From an old Print.*)

THERE are many places in the country which, from a historical point of view, form a kind of England in miniature, touching the history of the nation at point after point from the earliest time down to yesterday. This being so, it has always appeared to us that the ordinary method of making approach to school history in such districts is utterly wrong, being, indeed, a reversal of the plan which common sense dictates.

We begin our geography with *Heimatkunde*, and gradually enlarge the circle of interest; but we follow the opposite course with our history and our literature for some obscure reason, regardless of the facts that there is history at our doors, and that the folk tales of any district or province are usually the best possible introduction to the literature of the land.

But they manage things better in a certain Kentish district not far from London. Here, at "Royal Eltham," our own contributor, Mr. R. R. C. Gregory, settled some nine years ago, and to-day he teaches the old standards of the district on what foundation they stand. The result of his research into the annals of his neighbourhood has recently taken tangible form, and every teacher in the country who wishes to know how to deal with the history of his own district ought to possess a copy of his handsome quarto, which is entitled *The Story of Royal Eltham*.*

MR. R. R. C. GREGORY.

There is at Eltham a palace which was in existence at a very early date in our history, but which was repaired and considerably extended in the time of King Edward the Fourth, and became for some three centuries one of the abodes of the English kings. This building is, of course, the greatest historical feature of the district, and Mr. Gregory does full justice to it in his entrancing story, omitting nothing which is calculated to rouse the interest of those who, like Dean Hole's young lady, are "awfully gone on ruins," and at the same time bringing the historical information connected with the building into the main current of the national story.

This, we repeat, is, to our mind, the chief object of the teaching of local history, which must never be permitted to become too parochial. Here, for example, is a piece of Eltham local history which affords a peep into a wider domain:—

> "It seems that about 1390 the neighbourhood of London was infested by robbers, who laid wait for travellers, and carried on their nefarious calling in defiance of the attempts made by the authorities to catch them.....Chaucer had occasion to come from Westminster to Eltham with some ten pounds in his pocket, to pay accounts, in pursuance of his duties as Clerk of the Works. When he reached Hatcham, which of course was out in the country in those days, at a spot known as the 'Fowle Oak,' he was set upon and robbed of his money, horse, and all his belongings. So there was nought to be done but to go back on foot to Westminster to get more money. Curiously enough, on his return, he was robbed again. The affair, no doubt, caused considerable stir in Court circles, for it was a most impudent thing to rob on the king's highway an officer of the king's household, and Chaucer was put to a great deal of inconvenience."

Surely any teacher of history or literature could use this to great advantage. It makes Chaucer considerably more real when you know that he was twice robbed on the highway not very far from your door. Moreover, the robbery appears to have been one of the causes which led to the poet's retirement to Woodstock, where he wrote *The Canterbury Tales*. So that, in a sense, even Eltham robbers may be said to have helped to make literature.

ELTHAM PALACE (INTERIOR).

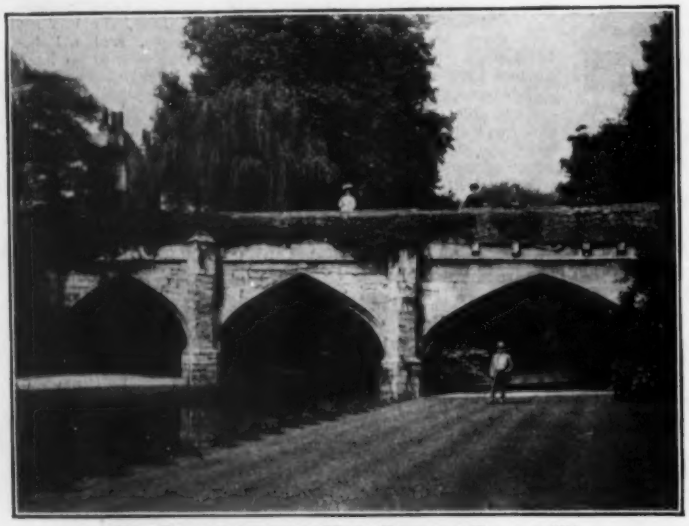
Mr. Gregory's own school stands at the end of Roper Street. The name affords another peep into history,

* *The Story of Royal Eltham.* By R. R. C. Gregory. With illustrations. Kentish District Times Co., Ltd., Eltham.

for the street was named from the Ropers, who were squires in the neighbourhood and had their residence at Well Hall. Sir William Roper was the husband of that Margaret, daughter of Sir Thomas More, whose history was set down by her husband at Well Hall itself. Such a historical connection gives Mr. Gregory an opportunity of which, we need scarcely say, he takes full advantage. Surely his pupils could desire no better intellectual treat than to read, or have read to them, the four chapters in which our author treats of "The Lady of Well Hall," and which together form a record of filial and wifely devotion worthy of the drama of ancient Greece.

We might go on multiplying instances of Mr. Gregory's method, but space forbids. In future issues of the *Practical Teacher* we hope to induce him to show us how the local history of any given district can be collected and utilised for the practical work of the school.

A word of special praise is due to the illustrations of this book. The volume contains a large number of excellent reproductions from photographs, one of which we are kindly permitted to include in this article.



THE BRIDGE OVER THE MOAT, BUILT BY EDWARD IV.

The book also contains an excellent collection of pictures from old MSS. and other obscure sources of the highest value to the historical student, as well as of practical importance to those teachers who are following Mr. Elgar's articles on the teaching of history and drawing.

A GUIDE FOR THE HISTORY TEACHER.*

READERS of the *Practical Teacher* are already familiar with Mr. M. W. Keatinge's *Suggestion in Education*, which is one of the most valuable contributions to educational science which have been published during recent years, and they will expect a great deal from any fresh effort on the part of this author. On the whole they will not, in our opinion, be disappointed in his *Studies in the Teaching of History*, recently issued by Messrs. Adam and Charles Black. They will find it full of that quality of classroom suggestiveness and of that practical application of educational principle which are dear to the heart of the British educationist.

Like a few other educationists of the present day, Mr. Keatinge has a pretty humour. Dealing with the everyday advantages to be derived from a study of history, he reminds us how the lessons of this subject affect even a General Election.

> The voter of the present day is asked to come to a decision upon matters of foreign and home politics. He is expected to have views upon social matters, and to act upon them at the polling booth; and he will criticise the report of the Poor Law Commission. He may belong to a religious community, or he may not; in either case he has his share in making legislation that decides the relation between the State and the Churches. He is not surprised if asked to choose between Free Trade and Protection, and is in no way deterred from doing so by his ignorance of both. He will decide what more "Dreadnoughts" are necessary, or fewer, as the case may be, hoping to find out at a later date what exactly a "Dreadnought" is and its importance to his country. He swells with pride at our position in India, and criticises the action of the Viceroy or the attitude of the Home Government from the lofty standpoint of the voter who ultimately controls both.

The author marks out three stages of history teaching—the first covering approximately the years between seven and twelve, the second those between twelve and sixteen, and the third the last years of school life; and he asserts that in the first stage the presentation might be æsthetic and "interesting" (horrid word!), in the second moral training might be introduced, while the third might be reserved for the tracing of cause and effect. He then proceeds to deal in detail largely with the second and third stages, so that very many of our readers will find little that is directly helpful for that classwork which is concerned with laying the æsthetic and "interesting" foundation. We wish Mr. Keatinge would write us a monograph on "interest."

It is refreshing to find a pedagogical book hailing from one of the older universities which condescends to deal with practical school method. Mr. Keatinge devotes the greater part of this volume to the *modus docendi*. He is even concerned about the apparatus to be used in the history lesson, and says very truly: "Most schools of any importance have a science laboratory, upon which a considerable sum of money is spent yearly; for the history lesson few schools supply any apparatus but a text-book and a blackboard. Natural science, as a branch of knowledge equipped with methods and apparatus, has had the start of social science."

The practical teacher will find the chapter entitled "Documents and Method" full of suggestion for what may be called laboratory work in history, though Mr. Keatinge rather studiously neglects that excellent method, sketched by J. R. Green in his masterly preface, which makes use of the interest aroused in the local antiquities for laying a sure foundation for the teaching of national history. The chapter on "Concrete Illustration" will also be found extremely helpful, while that on "History and Poetry" is distinguished by a tolerance, which to our mind is somewhat too easy, in the matter of selecting passages of real literary merit.

* *Studies in the Teaching of History.* By M. W. Keatinge, M.A. Adam and Charles Black.

GEOGRAPHY NOTES UP-TO-DATE.

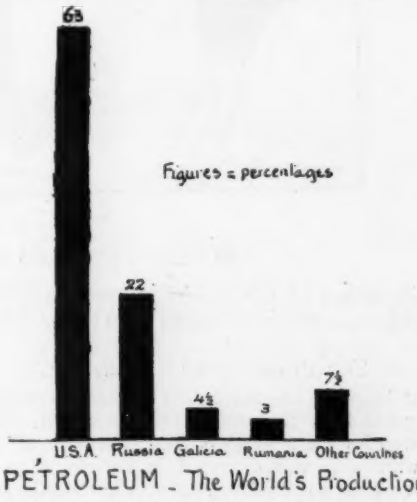
BY E. R. WETHEY, M.A., F.R.G.S.

The Industry of the Caucasus.

THE oil-fields of the Caucasus are of quite modern development, though most of them, as in the case of Maikop, have an ancient history. Beginning at the western end of the great mountains, they stretch along both north and south flanks, and along and beyond the northern frontier of Persia as far as Merv and Sarakhs. No wonder that, as a well on fire was no uncommon spectacle, these lands were often visited by Persian fire-worshippers, nor that the famous Hereford *Mappa Mundi* places the "Mouth of Hell" in this quarter of the universe. But beyond worshipping —at a safe distance—the Persians did nothing. Russia annexed the territory in the early years of the nineteenth century, and sixty or seventy more years elapsed before any attempt was made to utilise this commercial asset in the Caucasus. Then two events happened. In 1872 the naphtha industry was declared free from excise, and in the 'nineties it was discovered that the waste products could be utilised. The freedom from excise lowered the price and encouraged a demand. The utilisation of the waste products more than compensated the oil owners for the reduction in price. Indeed it was one particular "waste" which made the Russian oil industry. "Mazut," as it is usually called—sometimes also "astatki," or "residuum," or "naphtha fuel" —is really the residue of crude petroleum after the lighter oils (kerosene, etc.) have been distilled. It is largely used for fuel in all sorts of engines, not only in Russia, but wherever it can be imported. Russian torpedo boats have experimented with it for power, and have demonstrated that where coal will compass four thousand miles, mazut will propel the boat seven thousand miles. Bunkers can be filled more rapidly, less men are required to tend the fires, less physical energy is demanded; there are no ashes, no cinders, and no smoke—advantages which go far to counterbalance the one serious disadvantage—namely, the danger that always exists in storing petroleum. The result has been to make Baku and district a busy hive of industry. Pipe-lines spread in all directions, apart from the great one of five hundred miles from Baku to Batum, and the railway nearly engirdles the Caucasus Mountains themselves. Four or five years ago the output was estimated at 3,000,000,000 gallons per annum. The well-known social troubles and strikes of the district have, according to some authorities, lessened this enormous production by 30 per cent.

The World's Production of Petroleum.

Important as is the Russian petroleum industry, and great as is its output, it is far behind that of the American. The most recent figures of the total world product are for 1908, and their comparative values are indicated in the annexed diagram. The United States produce nearly three times as much as the Caucasian output. The world figures themselves show an advance of some 30 per cent. even on those of 1906, for the trade in petroleum is an ever-increasing one. Reckoning it in tons, it has now reached the enormous amount of nearly 40,000,000, or, say, between ten and twelve thousand million gallons! And it is still quite young. Russia did nothing much before the 'eighties; and though the United States struck its first bore so long ago as 1859, it took something like twenty years to develop into a first-class trade. "Now," says Chisholm (*Commercial Geography*, p. 186), speaking of Pennsylvania alone, the pioneer state in the industry, "there are about 20,000 wells in districts scattered all over the region, with about 4,000 miles of pipes, which run their products into great central refineries, and thence to the great oil markets." Outside of the United States and Russia, Galicia and Rumania lead the rest. The "Galicia" in question is, of course, that curious outlier of Austria which, though as large as Scotland, is often lost sight of in the bigness of the dual monarchy. Lemberg, one of its chief towns, claims to have



PETROLEUM. The World's Production

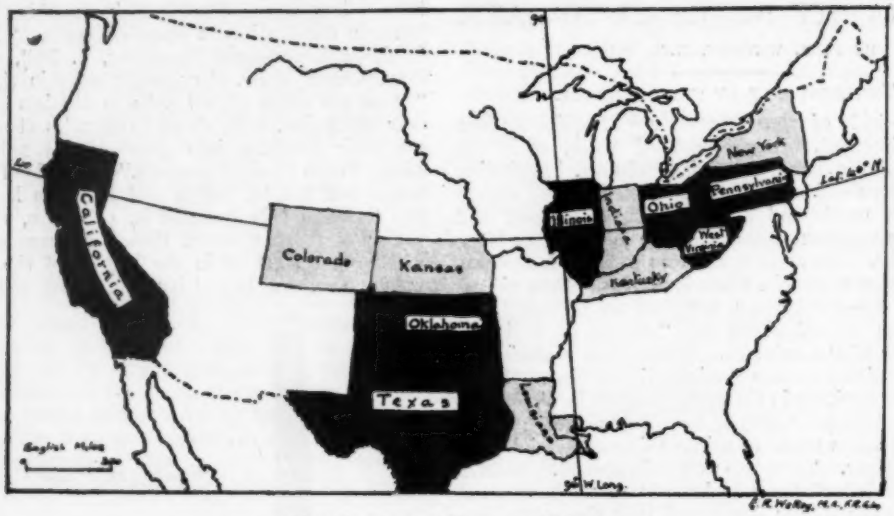
been the first town in Europe to boast a petroleum lamp. Drohobycz, to the south-west, on the sandstone of the Carpathians, is the chief centre of the modern industry. In Rumania a great industry is growing up north-west of Bucharest and south-west of Jassy, and is only awaiting the necessary extension of pipe-lines to become greater still. It is interesting to note that its production is largely under the control of an English company. The "other countries" in the diagram comprise Ontario in Canada, Venezuela, Peru, some of the West Indies, Burma, Sumatra, Java, Japan, New South Wales, and New Zealand.

United States Petroleum.

But where is this great American field? Up to the middle 'eighties, 95 per cent. of the American product came from the original field, a great strip of some 160 by 40 miles in the states of New York and West Pennsylvania. Now the area is far wider, and the great producing districts are remote from the original ones of Colonel Drake's discovery. Four great divisions are very prominent on the map, which has been compiled from the latest figures. These are:—

1. Oklahoma (25) and Texas (7), furnishing 32 per cent. of the total;
2. California, furnishing 24 per cent. of the total;
3. North-west Ohio (7), Pennsylvania (6), and West Virginia (6), 19 per cent. of the total;
4. Illinois, 15 per cent. of the total;

—which together are responsible for some 90 per cent. of the whole American output. After them come—*longo intervallo*—in order, North-East Indiana, Louisiana, Kansas, New York, Kentucky, and Colorado. The



THE PETROLEUM STATES OF U.S.A.

■ Over 15 per cent., ▬ under 15 per cent. of total American production.

most important of our *British* oil producers, Burma, would take up a position about equal to that of Louisiana!

THE REVOLUTION IN TRANSPORT.

Great has been the revolution in area, but even more striking has been the revolution in transport. Back in the 'seventies an ox-wagon conveyed the oil to the port, whence it was exported in barrels. The wagon has given place to pipe-lines, the barrels to tank-steamers.

The first American user of pipes was the Pithole Company, actually as early as 1865, but nothing larger than a 2-inch pipe was seen before 1873. Now there are 12-inch monstrosities. And as for length—the Standard Oil Company owns 40,000 miles! The longest pipe-line in the world is that from Oklahoma to New York, *via* Chicago, 1,400 miles. The revolution in ocean transport can be seen from the following comparison:—

1885. United States sent 200,000,000 gallons of oil to Europe, of which only 1¾ millions were *in bulk*; now the United States sends 500,000,000 gallons, of which only 1¾ millions are *in barrels*.

The first tank-vessel — that is, for carrying oil in bulk—was built on the Tyne in 1863. She was an iron sailing-boat. Twenty years later fine boats of 300 feet long and 2,300 tons were in use; but these seem small beside those turned out nowadays, say, by a firm like Harland and Wolff's, which recently built an oil-steamer over 500 feet in length and with a tonnage of 10,000. It was the rivalry between Baku and Pennsylvania that developed this phase of the petroleum trade.

THE FLOODS OF THE SEINE, JANUARY 1910.

Many and varied are the theories which have been advanced to account for the disastrous rise of the Seine at Paris in January. Deforestation is one—in face of the fact that over much of the region drained by the upper tributaries of the Seine there has been as much afforestation as deforestation. Another is punishment—"by act of God"—for the notorious ill-treatment of the religious orders. Even the "Daylight Comet"—not to mention Halley's—has been blamed. The explanation, however, appears to be extremely simple. A combination of continued bad weather, ranging over a marked convergence of waterways, accounts for everything. Dr. Herbertson of Oxford put the whole affair so clearly in an article he wrote for the *Morning Post* on January 28 ("Natural Causes of the Overflow") that we make no apology for condensing his remarks for these columns. The Seine is really a very regular river. The only years which are comparable to this of 1910 are 1876 and as long ago as 1740. This regularity is a natural consequence of the conditions governing the waters of the Seine basin. The rainfall is evenly distributed throughout the year, as a rule. The underlying strata are for the most part porous, tending, therefore, to uniformity in the matter of surface flow. If the river does rise higher at one time than another, it will naturally be in spring or winter, when evaporation is diminished. Given such conditions, an abnormal rise must be the effect of abnormal meteorological causes; and this is just what happened. Continued wind from the west, bringing continuous snow and rain, just when evaporation from soil and vegetation is least, and when the soil is either frozen or so saturated that most of the surface water runs directly into the river-beds, affected the whole basin—main stream and tributaries alike—*at the same time*. *Hinc illæ lacrimæ*, literally. And any one who looks at a map of the basin of the Seine can hardly fail to notice how the waterways of Marne and Yonne, and a host of minor streams, converge on to the point where Paris has risen—indeed, that is partly the reason why Paris stands where it does. Given, then, the abnormal weather conditions which prevailed throughout January, disaster was almost bound to follow. It says much for human science and industry that the times of stress are so few and far between.

NEXT MONTH.

An important announcement concerning a scheme of

FREE SCHOLARSHIPS

for Readers of *The Practical Teacher* interested in practical education.

AGRICULTURAL EDUCATION.

A SCHEME OF WORK FOR RURAL SCHOOLS.

BY W. FRANCIS RANKINE.

Seedtime in the School Garden.

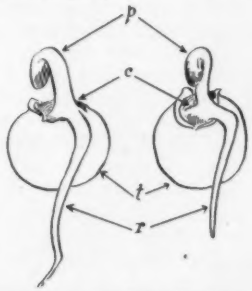
IN the general interests of agricultural education the school garden is a most valuable adjunct to the village school. By this I do not imply that its value is lost in any degree in the curricula of the urban or suburban schools, since it will be admitted that in these the policy of horticultural instruction is not so intensive as it necessarily must be in the rural school. In the latter, school gardening bridges the gap between classroom instruction and the operations of farm and field—that is, it links up two realities, and emphasises the fact that agricultural and horticultural operations are applications of the knowledge which we reach, or should endeavour to reach, by educational method. Therefore the subject can only be successful in those cases where correlation between classroom teaching and garden practice is zealously and judiciously observed. The approach of seedtime—which in our southern districts will have arrived by mid-March—offers a splendid opportunity for establishing such a correlation. At the very least, this ensures an intelligent attitude of mind on the part of the youthful gardener, who otherwise might pardonably regard the sowing of a seed as an empirical observance of a calendar-guided ceremony, which, by some mystic indulgence of Nature, is followed by the appearance of a seedling. To preclude the possibility of such a conception is the aim of the earnest rural teacher.

Preparatory Work in the Classroom.

The study which should be essayed before actual sowing takes place in the school garden is chiefly connected with the germination of seeds—a study which legitimately belongs to the Nature scheme. In this direction many experiments are possible, and in general outline these are familiar to every Nature teacher. The aim, however, of this instruction should be to emphasise the very close relationship which exists between the seed and the soil. The latter must be regarded as the medium by which the influences that control germination are brought to bear upon the embryo within the seed. Therefore it will be insufficient to determine that air, heat, and moisture are the three essential factors of germination. The teaching must proceed to discover how these conditions are secured in the seed-bed. It should demonstrate the changes which accompany the first stage of the life-history of a plant—namely, that period of existence which is independent of soil nutrition. The following outlines of procedure suggest experiments which will help in this work.

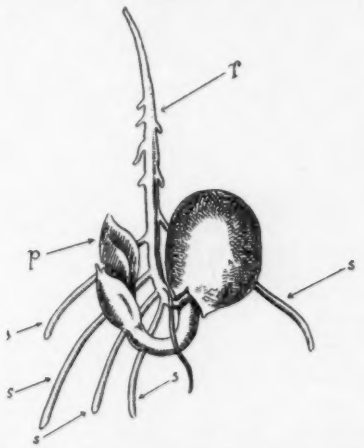
Experiment 1. *Seed Development.*—Obtain a fairly large lamp-glass, and line it with two or three thicknesses of blotting-paper. Place a few large seeds, which have been soaked for twenty-four hours, between the blotting-paper and the glass, so that they are visible. Place this piece of apparatus in a jam jar partially filled with water. Observe the changes which occur. Make sketches daily, and enter a record of the succeeding phases of development. Note particularly how the radicle frees itself from the seed.

Experiment 2. *Development of Radicle and Plumule.*—Take a few well-developed seeds as obtained from the preceding experiment, and pin them to a ruler marked in millimetres of tenths of an inch. Place the seeds so that they are kept moist. Take readings of the lengths of the radicle and plumule day by day. Observe which develops the more rapidly.



Experiment 1.—Seed Development.
References: *p*, plumule; *c*, cotyledon; *t*, testa; *r*, radicle.

Experiment 3. *Direction of Growth of Radicle.*—From the experiments performed it is seen that, whatever the position of the seed, the radicle always turns downwards. Allow a large seed—a broad bean answers well for this purpose—to develop until the radicle is nearly two inches long. Make a sketch of the specimen. Then invert the seed, and leave it for a few days. It will be seen that well-developed secondary roots have developed, and that these have turned downwards, while the tip of the primary root has either turned or ceased to grow. The seed may be inverted again, and a similar change occurs. This geotropic behaviour is characteristic of roots, and explains why the primary root which is developed by the seed always strikes downwards into the soil, regardless of the position of the seed.

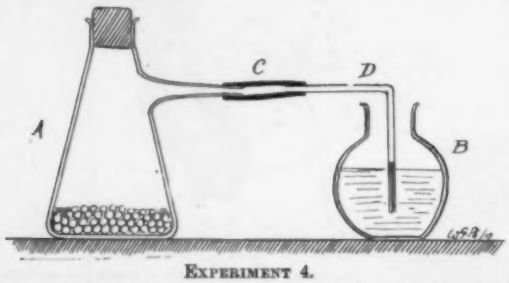


Experiment 3.—The Geotropic Behaviour of Radicle.
References: *p*, plumule; *r*, the primary radicle; *s*, *s*, secondary roots.

At the same time, this experiment demonstrates the heliotropic, or turning to the light, behaviour of the plumule. This plant organ always makes for the light, and many experiments to demonstrate this fact will present themselves to the teacher.

Experiment 4. *Production of Carbon Dioxide during Germination.*—Place a number of peas in a flask with sufficient water to cover them. Cork tightly and leave for twenty-four hours. Remove the cork, and a sound

is heard. Test the air inside with a lighted splinter. Carbon dioxide is found to be present. The sound heard when the cork is removed indicates the inrushing of air, and that the volume of air originally in the flask has diminished. A smell of fermenting is noticeable. Thus we are enabled to arrive at an idea of the changes which accompany germination. Water is absorbed by



EXPERIMENT 4.

By means of this apparatus a slight modification of the experiment given in the text is possible. A is a flask containing peas and a little water; it is tightly stoppered. B contains coloured water, and the bent tube (D) is connected by a rubber tube (C) to A. Any change in the volume of air in A is registered in D.

the seed, and the seed store is altered; oxygen is absorbed, and carbon dioxide is liberated. The diminution of volume indicates that more oxygen is absorbed than carbon dioxide is produced.

Experiment 5. *Generation of Heat during Germination.*—Place a thermometer in a flask containing some peas which have commenced to germinate. Close the neck of the flask with cotton wool. Place the flask in a box, and surround it with the same material. Note the readings day by day, and place another thermometer close by, so that the changes in the temperature of the room may be noted for the purpose of checking the readings. Why is heat generated?

These experiments unfold the story of the development of the seed under influences which in the classroom are more or less artificial. The next step is to determine the behaviour of the seed when it is placed in the soil; but here, unfortunately, the early changes are not visible. It will be observed, however, that in the classroom experiments the seedlings obtained only live to a certain point of development; and this marks the transition from the independent to the dependent existence of the plant. When the food store contained in the seed has been used, the seedling obtains sustenance from the soil and the air—from the former by means of its roots, and from the latter by means of its seed leaves. When a seedling has arrived at the seed-leaf stage, it will be found that the seed has wasted away and only its coat remains. Special attention should be given the runner-bean and onion in this respect, since their seed-coats appear above the soil.

WORK IN THE GARDEN.

In the classroom we have determined the conditions under which germination is possible. In the garden we must observe how these conditions are secured. The presence of air, warmth, and moisture is essential to the successful development of seeds, and the discussion of each factor is interesting. In passing, we may note that it involves reference to some of the work we have already carried out with regard to the soil and its physical properties. (See *Practical Teacher*, July 1909.)

1. The presence of air is secured by soil cultivation. Thus it is essential that the seed-bed should be thoroughly well prepared. As a rule, the soil is dug in late autumn and thrown open to the action of frost, which eventually reduces it to a fine state. Immediately before planting, digging is again carried out, and the surface of the garden made fairly smooth. In this way, numerous fine passages are formed, which act as conduction channels for air to enter and surround the seed.

2. The question of warmth primarily depends upon the season of the year, yet other considerations must be taken into account. A heavy soil, for instance, will contain a considerable amount of moisture, which means a lowering of temperature of the soil. A light soil, on the other hand, will be fairly dry, and usually retains heat well. Then the aspect of the plots must be considered.

3. The amount of moisture present in the soil will depend, first of all, upon the rainfall of the preceding months, subject, of course, to the physical nature of the soil and its drainage. Excess of water will retard germination, for the reason mentioned in the foregoing note.

Generally, these three considerations will vary with every district, and it remains for each gardening centre to determine its own specific conditions by attending to its local peculiarities, which in themselves will provide interesting material for recording. The time to plant will be determined by the general advance upon the garden which is evident in the spring throughout the land.

The next point is to determine the depths of drill required by the individual crops. This is chiefly controlled by the size of the seed. The distance between the drills is guided by the height to which the plants will eventually attain. These considerations introduce us to the work of the green leaf, the extent of root action, and the economics of plant life in general, to which we will refer subsequently. There is one point which demands vigorous attention at the actual time of sowing, and that is the quantity of seed required for the drills. Invariably, sowings are made too thickly, with the inevitable result that weak seedlings are obtained, or else much labour must be expended on thinning.

All particulars of the planting operations should be recorded—namely, date of sowing, name of crop, depth of drill, and distance between the drills. Following this, weather conditions prevailing until the first appearance of the crop should be recorded.

UNIVERSITY OF OXFORD SCHOOL OF GEOGRAPHY.

FIFTH BIENNIAL VACATION COURSE, AUGUST 8–25, 1910.

Preliminary Announcement.

THE Vacation Course will be opened by an introductory lecture on Monday, August 8, 1910, at 8.15 p.m. There will be at least two lectures, and a period of practical work in field or map-room, or an excursion, each day. Special evening lectures and discussions will be arranged. The chief courses of lectures will probably be on the geography of the British Isles and Empire.

Courses of practical work will be planned both for those who have not done any before, and for those with some experience. The former will consist of at least four demonstrations in the field and six lessons in the reading, measurement, and making of maps in the map-room. The latter will consist of more advanced map-making in field and map-room, and of seminar work. Intending students should state for which course they wish to enter.

As the numbers will be strictly limited, especially for practical classes, names should be sent in *as soon as possible* to the Secretary, Vacation Course, School of Geography, Oxford.

The fee for the whole course will be £3, 3s. The fee for course, exclusive of practical work, will be £2, 2s. Certificates of attendance will be given only to those who take the whole course, and do all the work connected with it.

A more detailed programme will be issued in June.

N.B.—Board and lodgings can easily be obtained in Oxford in August at reasonable rates.

The Senior Curriculum.

BY JOHN PERKINS.

(*Continued from page 469.*)

Art and Industry.

UNDER this heading we include all forms of constructive work—drawing, modelling in clay or plasticine, and exercises in wood and metals. Combined with a wide course in English, this group forms a means of co-ordination *par excellence*. No syllabus in art and manual work can be considered satisfactory which does not include exercises in drawing and modelling illustrative of the lessons in history and geography, nature and literature, and the construction of models and apparatus to exemplify the teaching of elementary mathematics and science.

There must also be a definite plan of art teaching dealing with the principles of perspective, light and shade, colour tones, and colour harmony. According to the needs of the subject studied, chalk, pencil, brush, pen, crayon, and charcoal should be employed. As far as possible a subject should be treated in a variety of media. Natural specimens may be sketched, developed into design, modelled in plasticine, and, if circumstances allow, the design may be carved in wood or embossed in metal.

The drawing from models should not commence with small objects. Large, bold drawings of the main school building, the play-shed, the school fence, and other similar objects should be attempted first, and general principles thus emphasised. It must be a very well-trained eye which can discern the vanishing lines of a match-box!

The keen teacher will have no difficulty in providing material for home exercises. Let these put into practice the principles and methods taught at school, and, above all, direct the work upon useful and practical lines—a home-made calendar, portfolio or letter-case, a kite or the model of a boat, carving in relief to decorate a stool or bracket, making scientific and geometrical models. Such exercises as these will be welcomed and executed with zest and enthusiasm.

The columns of the *Practical Teacher* have contained much material for inclusion in any scheme, but it will be necessary to avoid too rigid or too detailed a syllabus. The schools of the United States undoubtedly have done much which is suggestive, and those who desire to see light in this matter of constructive work should make a point of consulting *New Methods in Education*, by Liberty Tadd (Kegan Paul).

Physical Exercises.

For physical exercises there are the Board of Education syllabuses, new and old, and one or the other are put into force in the majority of schools. Despite the alteration of the words of command in the new syllabus, it is on the whole an advance upon that which preceded it, in that it devises a progressive course, and adds much physiological information which must be of service to the teachers.

The individuality and free play of our football, cricket, and hockey should not be organised out of existence. These games, of such great influence in the formation of character, will be better when taken as pure recreation outside the time-table course. Organised games for infants and juniors are in another category. The elements of dancing may be introduced, under wise control, for the older scholars, and should have an improving effect upon their carriage and bearing.

In connection with the physical exercises a course of lessons should be arranged dealing with hygiene and temperance. Especially with the children approaching adolescence, it will be necessary to explain discreetly the functions of the main organs of the body. Tact and sympathy will be required, but the ignorance which now exists owing to mistaken ideas of modesty must be expelled in the interests of health and morality.

Vocal Music.

Vocal music should be one of the most eagerly anticipated lessons of the time-table. A short time should be devoted daily to voice production, and to exercises to train the ear and sight. The main lessons should be devoted to the practice of good music. It will be well to classify the voices according to quality into three sections. The classification should be periodically revised, so that scholars who improve may pass into a higher group. The inner circle—the choir—will be found valuable when it is necessary to show "how it should be done."

Pains should be taken to cultivate pure enunciation. When a provincial "twang" is strong—especially in the London district—the singing lesson may be made a valuable corrective.

Of material there is enough and to spare. National songs should have due place, but should not monopolise the time. A selection of classical music in two or three parts should be provided. It will be well, however, to get good unison singing before an attempt is made with part songs. The singing, too, should be definitely associated with the literature and the history. Classical lyrics and ballads in plenty have been set to standard music, as a reference to the catalogues of Novello and Curwen will demonstrate. In addition to these sources, selections may be made from Boosey's *National Songs*, and Cassell's *Dulce Domum* and *Gaudeamus*.

One lesson in each week during the time devoted to religious instruction may well be devoted to sacred singing by the whole school. The combined rendering of hymns and carols with feeling and sympathy has a moral and æsthetic influence of the highest value.

Do not occupy the whole singing lesson in learning something new. See that there is an ever-increasing repertoire, which may be revised again and again. The children love to sing the rhymes and songs and hymns which are familiar, and, if the selection largely consists of musical classics, it is well that they should become a fixed heritage.

NOTICE.

The Editor greatly regrets the enforced omission in this issue of the second part of—

1. Mr. Birchenough's paper on "Reform in the Geography Syllabus of the Primary School."
2. Miss Polkinghorne's article on "Christian Names."

The concluding portion of each of these papers will be given next month.

RETIREMENT OF A NOTED SCHOOLMASTER.

AN APPRECIATION OF MR. J. T. FRANCOMBE.

NOT long ago a memorable ceremony took place in the parish of St. Mary Redcliffe, Bristol. In the afternoon of that day the popular and truly great head master, Mr. J. T. Francombe, hauled down his flag and retired from active service—as a schoolmaster—after half a century of public service. The 630 boys of the Redcliffe Endowed School marched into the adjacent parish room. The vicar and the new headmaster, in the name of the managers and the boys and teachers, bade him farewell, and presented him with a clock as a mark of their affection. Mr. Francombe made a short but effective speech, counselling the boys to remember

their two best friends were God and their mother; and he then performed his last duty in connection with the school—saying prayers. With each lad as he passed out he shook hands; and thus closed the official career of one whose name deserves to rank with that of Arnold and Thring.

Thirty-seven years ago Mr. Francombe was appointed headmaster of Redcliffe Boys' School, which then had 180 boys on its roll. Under his *régime* the school rapidly won a reputation, which has been maintained with increasing glory as the years rolled by, and the numbers now are 650.

During his thirty-seven years of office over 10,000 boys have passed through Mr. Francombe's hands; and as one walks with him through the crowded thoroughfares of the western metropolis, one realises the truth of his statement that every fifteenth man one meets was a Redcliffe boy.

On Friday evening, November 19, a second and more memorable gathering assembled in the same hall. The clergy and citizens of Bristol, the parishioners and Mr. Francombe's old teachers, met to celebrate his jubilee of service, and to present him with a £90 annuity as a token of their admiration, love, and respect. This will prove an acceptable addition to the small pension of £34. To be present on this occasion some of his old teachers—amongst whom was his first pupil teacher, Mr. C. W. Hole, President of the N.U.T.—travelled long distances.

The Bishop of Bristol, the Chairman of the Bristol Education Committee, the Vicar of Redcliffe, the President of the N.U.T., and others bore testimony to Mr. Francombe's brilliant career, whilst four bishops wrote regretting their inability to attend. As the Bishop of Bristol said, "Mr. Francombe is a remarkable man, one of such you do not often come across. I myself can count those I have met on the fingers of one hand."

The Chairman of the Education Committee spoke of his great power as a teacher and of his tremendous influence over the young, and the Vicar of Redcliffe said: "There are two kinds of great men. To one class belong originators, thinkers, and dreamers; to the other class belong men of action. Mr. Francombe is a man of action, and as such he has excelled;" and the President of the N.U.T. emphasised the fact that he taught boys the "nobility of work."

Of the teacher one may say as of the poet, "*Nascitur non fit.*" And herein lies the secret of Mr. Francombe's success. He possesses those qualities which are essential to the dominie—tact, organising capacity, cheerful optimism, love of humour, and unselfishness. Combining sympathy with the young with the firmest of discipline, he ever worked towards the highest ideal educationally—to train the child spiritually, morally, mentally, and physically.

Essentially a man of action, punctilious in the execution of duty, and, like all born leaders, scrupulously loyal and devoted to those whom he was called upon to serve, Mr. Francombe is a man who might have won a name in any walk of life. He has been a member of the Bristol Education Committee from its inception, and is on no less than thirteen sub-committees. His fellow-teachers have shown their confidence in him by electing him as President of the National Federation of Church of England Teachers, and four times he has been chosen president of the local branch of the N.U.T. No man has done more valuable work for the youngsters' sport in Bristol. For more than twenty years he has been honorary secretary of the schools' swimming branch of the Bristol Humane Society, and is chairman of the Bristol Schools' Rugby Football Committee and Cricket Committee. Mr. Francombe has always interested himself in the moral and social welfare of his fellow-citizens. He has done yeoman service for the temperance cause in Bristol, being the President of the Gospel Temperance Society, and a much-sought-for lecturer and speaker on this subject. He is an enthusiastic Freemason, and President of the Bristol Antiquaries.

Although his activities are thus often commandeered by the city at large, it is the parish of St. Mary Redcliffe that claims his best and most devoted service. He typifies parochialism in its widest and best sense.

There he is at home, and is a living exception to the saying, "A prophet is not without honour save in his own country." Here, within the shadow of the finest parish church in England, has he worked, the much beloved and highly valued friend of six vicars, has served as churchwarden and vestryman, has voluntarily taught and superintended the Sunday School for a period of over fifty years, and is the chairman of the parochial branch of the C.E. Men's Society. It may be said with absolute sincerity that such a man has vividly recognised the great truth that life is an opportunity for service.

To talk of leisured retirement in his case is a misnomer. He often used to say to his fellow-workers, "It is better to wear out than to rust out"—and so it will be. Mr. Francombe's life of self-sacrifice is not yet ended. With him it is merely change of work. He will die in harness, God willing. As I conclude this inadequate sketch, I am reminded of how much I, in company with many others, owe to this great man. The Iron Duke's motto, "I am here," in three words sums up his character. He has always been there where duty and self-sacrifice called him.

To succeed such a one is a difficult task, but the right man has been chosen in Mr. John Clibbens, who for many years has been Mr. Francombe's loyal, devoted, and capable subaltern, and who has the good wishes of all old Redcliffians. "Floreat Redclyffe." E. D. F.

RECITATION IN THE GIRLS' SCHOOL.

BY MARY S. JACOB.

THE fact that our elementary education has been too much all of one pattern is now universally admitted. That it is impossible to treat all schools alike, and that the personality of the teacher and the peculiar circumstances and environment of the children must permeate the curriculum, is a recognised fact. Yet there are certain broad lines which are of general application; and in choosing extracts from the poets and samples of fine English prose for memorising purposes, an absorbing interest for a whole lifetime has to be considered—and a lifetime begins early!

In this short paper we have to determine what "recitation" is more especially suitable for girls. In many ways they are harder to cater for than their brothers. At least we, their teachers, often think so. It is after considerable experiment in this direction that I am of the opinion that such selections as appeal to the sense of beauty, of pathos, and the love of Nature, together with others tending to develop imagination, originality, and humour, are best fitted to reach these our scholars—to elevate, ennoble, and refine them. I need hardly add that every scheme would do well to include some patriotic and national poems, others of historical interest correlated with the history or literature lesson, and a few carefully chosen ballads.

It will be found that the poems of Tennyson, on account of his consummate taste and refined style, are eminently fitted for the girls' department. They speak of the beauty of life, and treat of humanity in all its moods. For senior classes, "The Lady of Shalott" can be well recommended as combining intense pathos with dramatic action. "The Dying Swan Song" and "In Memoriam" may be considered too "serious" by many teachers, but portions learned by heart will form a precious treasure of inestimable value to the child in her after years. It is not necessary to touch on the "Idylls" in connection with this poet. There are few English writers who have commanded so much appreciation in the classroom as Tennyson has in these works of rare delicacy and literary charm.

To develop the imaginative and humorous sense one cannot do better than learn, amongst others, "The Pied Piper of Hamelin." This poem of Browning's adapts itself admirably for dramatic representation; and the accompanying photograph, taken from a group of girls after such a recital, shows how effectively it may be arranged. The descriptive portions of the narrative were rendered by the little girl on the right of the picture dressed in a simple white frock. The other characters speak for themselves.

In order to awaken a love for "Nature," Shelley's exquisite poems, "The Skylark" and "Ode to the West Wind," will be found of great service. These are, of course, only suitable for advanced work, but there is found a melodious thrill and passion for the splendours of the natural world which is in itself of a high educational value. In Keats's "Ode to Autumn," and

THE PIED PIPER, MAYOR AND CORPORATION, SUNDRY RATS, ETC.

Wordsworth's "Evening Walk," the pageantry of sunset that "finds its frequent echo in the East," the moving cloud-shapes, the long shadows on field and hill, are depicted in the language of a poet brimming with England's charm. Let me mention, in connection with these poems, "The Coming of the Flowers," by Sidney Dobell; "A Story of the Nightingale," by Coleridge; and Wordsworth's "To the Daisy," as having been found most acceptable in Standards III. and IV.

For recitation purpose, Burns is generally voted too exclusively national for the average girls' school, but we find in Sir Walter Scott an exquisite ring of lovely songs and ballads. The universal Shakespeare rightly enters everywhere, and some charming character studies of women are found in his plays. It is impossible to omit the poems of Jean Ingelow in writing on this subject, especially the pathetic appeal of "High Tide on the Coast of Lincolnshire." In the intermediate classes, Longfellow will be found very useful. Selections from "Hiawatha" and "Evangeline," together with many of his shorter poems, can be learned with comparative ease. I think that most teachers will agree that the choice of suitable recitation for the junior scholars is not such an easy matter as might be imagined. The logic of childhood is simple and relentless, and if a poem does not appeal to our young people, they quickly become unresponsive and hopelessly "dull." Short extracts from

C. Rossetti, Eugene Field, and R. L. Stevenson have been discovered to interest these critical little mortals; whilst "The Singing Lesson" and "Seven Times One" of Jean Ingelow, together with the shorter poems of E. Nesbitt, never fail to be attractive. For the "town" child, a little poem, "Child's Song in Spring," is to be highly recommended.

In considering the subject of "prose recitation" one is confronted by a problem. Should the selections be detached passages of especial literary and artistic feeling, or is the preference to be given to portions from carefully chosen books previously studied by the child?

After carefully testing both these methods in a girls' elementary school, I may reply that the latter has been found the more satisfactory in every way. It is really quite surprising to find how very popular "prose recitation" becomes amongst the scholars if treated in this manner; and, while useful in developing "style," it also serves to train the memory. Portions from books by Kingsley, Dickens, Stevenson, Gaskell, Goldsmith, etc., may with great educational advantage be learned by the girls; while for the lighter side, Kipling, Hans Andersen, and Lewis Carroll answer admirably. The children in the school mentioned above are at the present time learning selections from *The Water Babies*, *Old Curiosity Shop*, and the *Elephant's Child* in the senior classes. These will eventually be "acted" by them. In the same department, "How the Camel got its Hump" ("Just So" Stories) is being committed to memory by the classes corresponding to Standard II. This is found well within the grasp of the children, who enter into Kipling's quaint humour with delight. The verses at the end of the story have been set to music, and are sung in connection with the rendering of this little dramatic sketch. *Alice in Wonderland* is now being attempted in Standard I. It has been found advisable to learn certain selected portions of the narrative, and then to connect the episodes by means of verses composed for the purpose and sung by the children.

Elementary education is frequently condemned as being calculated to destroy all the poetry and imagination, all the love of Nature and artistic inspiration, lying dormant in the heart of a little child. Whilst this aspersion is most unjustifiably untrue, may I say in conclusion how essentially useful in training and developing this inborn æsthetic sense is the use of a poetry-book reader in *each class*. I know of nothing so calculated to aid "recitation," and give young girls, by gradual process, a high standard for noble English verse. It also serves to make them familiar with the words of many fine poems, so that a quotation is at once recognised, whilst the music and movement of poetry becomes unto them a living thing ever present in the memory.

THE FAVOURITE SCHOOL PLAY.—Theatrical and educational circles are keenly interested in the experiment which Mr. Arthur Phillips is making at the Royal Court Theatre, Sloane Square, for a brief season commencing Saturday, February 19. Mr. Arthur Phillips will produce *The Merchant of Venice* on a most elaborate scale. Two distinctive features of the performance will be the vocal music and dances composed by Ernest Bucalossi and Hartley Milburn respectively. Mr. Bucalossi, it will be remembered, was the composer of the music for the Chelsea Pageant. Special costumes have been designed for the production. Mr. Phillips, who will essay the part of Shylock, is an actor of great ability. Although comparatively speaking a newcomer to London, provincial critics speak of him in terms of the highest praise. Miss Amy Brandon Thomas will be the Portia, besides which the company includes the names of many popular London artistes. We hope to give an illustrated account of the performance in our next issue.

THE REPAIRING OF GARMENTS IN GIRLS' SCHOOLS.

BY J. A. FLEMING.

(*Continued from page 267.*)

THE pinafores worn by any class will form an excellent starting-point for the teaching of general repairing. They will also provide suitable subjects for discussion as to what places should be strengthened or mended, and the best means of securing the most satisfactory results. Most girls will know by experience that the weakest place is under the arms. The slits or tears which occur there, being longitudinal, are typical of others which may be found in print aprons, cotton skirts or dresses, and in such places as the *openings* in calico skirts, nightdresses, shirts, chemises, drawers, etc.

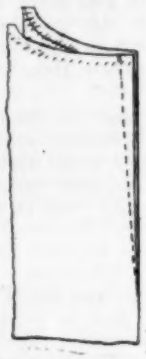


FIG. 1.—RIGHT SIDE.

FIG. 2.—WRONG SIDE.

Repairing Slits in the Armholes of Pinafores (Fig. 3).—These tears are of such frequent occurrence, and, as has already been said, they form such a useful general exercise, that a special lesson or series of lessons devoted to them will form an admirable introduction to the art of mending.

As a means of *prevention*, narrow tape may be laid round the lower half of the curve of the armhole (on the wrong side) and hemmed.

It is often advisable to do this after repairing the slit, to make the top, where the greatest strain occurs, stronger. Several methods are suggested, any of which the teacher may adopt, according to the degree of proficiency attained by the pupil or her capacity to receive instruction. In all cases where the longitudinal tear

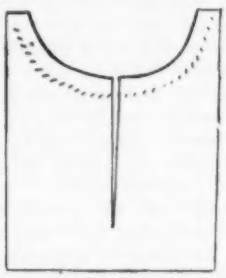


FIG. 3.—PINAFORE SLIT UNDER THE ARM.

does not reach the bottom of the garment the turnings should diminish as the corner is approached.

1. *By Means of Counter-Hemming.*—Lay a tiny fold along one edge of the slit, on the *right* side of the gar-

ment, and one on the *wrong* side, along the other side of the opening (Fig. 4). Place these folds face to face, and tack them through the middle, so that only a narrow

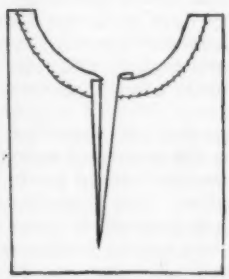


FIG. 4.—FOLDS FOR COUNTER HEM.

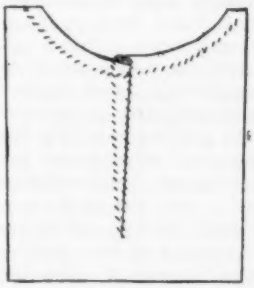


FIG. 5.

fell is the result. Hem both edges. Take out the tackings (Fig. 5).

2. *By Means of a Seam and Fell.*—Make a narrow fold on one side of the slit, on the *right* side of the garment. Turn this back again to form a fell, which should be as deep again as the first fold. Make a narrow fold on the opposite edge on the *wrong* side. Tack the two together, and seam neatly. Take out the tacking threads, stroke the seam *thoroughly*, and afterwards hem the fell.

3. *By Means of a Run-and-Fell Seam.*—This is adapted to loosely woven materials where the closer seaming stitches would be unnecessary. Place the two raw edges together with their right sides inside and facing each other. The raw edge of the back strip should project a little above the front one. Turn the back edge down over the front one, and tack through the *three* thicknesses of material. Run just below, and close to the raw edge. Flatten the fell down, so that no fold or pleat is seen on the right side. Hem neatly and take out the tackings.

4. *By Means of a French Double Seam.*—This is quickly done, and is specially suitable for muslin pinafores. The garment is turned *right* side out. Place the two edges together with the wrong sides inside. Tack them about one-eighth of an inch below the top. Run evenly, close to the tackings. Remove the tackings. Turn the pinafore *wrong* side out. Tack the join again, so as to enclose the raw edges, which should not show when the sewing is completed. Run *below* the tackings and take the latter out.

(*To be continued.*)

SPECIAL NOTICE
to Teachers in Girls' Schools.

The Editor has asked Miss Fleming to write a short series of papers on

THE USE OF THE SEWING MACHINE IN GIRLS' SCHOOLS.

The first paper of this series will be printed next month.

The Editor would be glad to consider short, helpful articles on the ordinary work of girls' schools similar to those which appear in the present issue.

MORRIS DANCING AND FOLK SONG

BY THE ESPÉRANCE CLUBS AT THE KENSINGTON TOWN HALL.

THERE is no doubt but that folk songs and morris dances have come to stay. They are fast becoming known in all parts of the country, due mainly to the efforts made by Miss Neal, whose girls' club first showed the public how delightfully fresh and invigorating the old English dances can be when taken up with spirit and enthusiasm. Four years ago the public were electrified with the first performance given by the Espérance Club; and though morris dancing is now everywhere in evidence, Miss Neal's girls are probably the best exponents of these fine dances in the kingdom.

One was not, therefore, surprised to find a full and appreciative audience at the Kensington Town Hall: there is something so novel in this return to country dancing. The mind is carried back to Elizabethan times, and delights in recalling the gambols which Shakespeare made a feature in his *Winter's Tale.* No one can tell how many ages before his time these dances were common in English villages at the feasts and fairs that were red-letter days in the countryman's life.

THE HANDKERCHIEF DANCE.

They are redolent of the fresh air and open fields. None but those in vigorous health could find the energy to dance "Sally Luker" or "Jockie to the Fair;" the quick steps with sounding footnotes must be seen to be believed. And as these are accompanied by simple yet haunting airs, one wonders why they fell into disuse.

Touchstone and Autolycus may have danced them in the way of business. The latter sang ballads to entice the shepherds to buy fairings for their sweethearts; and if we may trust Shakespeare, the lads and lassies knew how to sing many a quaint song in parts. "There's scarce a maid westward but she sings this ballad," says Autolycus; "'tis in request, I can tell you." "We can both sing it," says Mopsa; "if thou'lt bear a part, thou shalt hear: 'tis in three parts." "We had the tune on't a month ago," adds Dorcas. It is a pleasant picture, the ballad-singer passing from village to village, and the peasants merry enough to learn new songs. We call to mind, too, that in the same scene the poet introduces two dances—one of shepherds and shepherdesses, and the other a wild, tumultuous business by twelve men, which dance "the wenches say is a gallimaufry of gambols, because they are not in't..... One of them, by their own report, hath danced before the king; and not the worst of the three but jumps twelve foot and a half by the squire." Brave dancing indeed! and not to be thought on in these days! For although there is plenty of vigour and robust stepping in the morris as danced by these healthy London girls, it is all pretty and within reason. There needs but a background of trees and fields, with the sun shining and the anxious business of the fair happily ended, to set the feet agog—if modern life had not put too heavy a hand on the countryman's lot.

No doubt in those former gayer days there was at times some reason for the Puritan's frown; and one can understand why, under Cromwell, the tabor and the pipes were silent, the wandering minstrels and ballad-mongers haled off to the stern justice, and the shepherds forbidden to dance. And if later days admitted the merriment once more, public opinion had too strong a hold to permit licence. But that tradition still counts was amusingly recounted by Miss Neal, who told her audience how, on one of her excursions through the country, to pick up the old dances and tunes from the few ancient countrymen who had learnt them in their youth, she was astonished to hear from one worthy that the saying in his village was that the *King of the Morris*—presumably the best dancer—must qualify for the office by being imprisoned three times for beating his wife, and three times for being too merry with wine—a somewhat disconcerting tradition, arising possibly from the feeling that a good morris dancer had an unusual store of animal spirits which found more than one pleasing avenue of escape.

Refine this ancient excess, deck your men with coloured ribbons, and dress your girls in the becoming sunbonnet, let there be jollity and good-humour, and you have the morris dance as it exists to-day. Beside this the stage dance appears a poor thing. Here are steps and combined movements eminently suited to healthy boys and girls. Let this be interspersed with songs and games, and you have an entertainment to give pleasure to the most atrabilious of persons.

There were over two dozen items. About twenty girls from the Espérance Club danced and sang; a dozen or so little people, between the ages of five and eight apparently, played old English games; and—an innovation, we think, at these public performances—half a dozen youths danced, dressed in the manner of the morris dancers—a curious but effective combination of beaver hat, nankeen shorts, gay bows and ribbons, and "bells on their toes," or, rather, round their ankles—a pleasing costume compounded of frivolity (in the bells and bows) and dignity (in the shining hat). One or two had scarves hanging from their waists. The general effect was decidedly novel. The high hat, rakishly worn at an angle, was the fitting crown and edifice to a dress recalling the gay days of George the Fourth, with a touch of Elizabethan frippery. Certainly the handkerchief dance performed by these six youths was a very hearty and robust affair, eminently in keeping with an outdoor life.

It appears from Miss Neal's investigations that there are no set steps to any morris, for the same performers introduced several variations, apparently without knowing it, into the most common dances. But there is a general rhythm and characteristic action which marks off one morris from another, the steps in each becoming more simple or more complicated according to the weather and the state of the feelings. The Espérance girls danced the now well-known "Bean-setting," but

"Bean-Setting."

it differed somewhat from the dance as we had seen it performed elsewhere; yet one could not confound it with others.

All the dances—"Bean-setting," "Hunting the Squirrel," "Jockie to the Fair," "Princess Royal," "Maid o' the Mill," and "Sally Luker"—the very names are enlivening—are alike bright, hearty, and, as danced by such expert performers as the Espérance Club, are as pretty a sight as any to be seen in London.

It was a happy thought to introduce the old English games. A few years ago these seemed in danger of dying out; but in dozens of elementary schools the infants may now be seen playing in chorus "Sally, go round the Moon," "Looby Loo," "Wigamy, Wigamy, Water Hen," often, it must be confessed, with a seriousness and intentness that might lead an unobservant person to think they were not enjoying themselves.

Perhaps the most delightful part of their performance at the Kensington Town Hall was the gravity and decorum of their play.

An excellent selection of songs had been made. Unless one has heard them, it is difficult to believe how quaint the words and how haunting the melodies are in such as "My Lady Greensleeves," or "I'm Seventeen come Sunday," or "Mowing the Barley," with its humming chorus; while as for "My Bonnie Boy" (admirably sung by Miss May Start), the manner in which the pathetic chorus breaks in after each verse can only be described as eerie.

It is impossible here to do more than mention the delightful hymn, "The White Paternoster," sung with fine spirit by the entire company, or the merry "Gently, Johnnie, my Jingalo." Some of these folk songs are, of course, more suitable for girls' clubs than for children in school, but many folk songs will doubtless become favourites as they become better known to teachers. As for morris and country dances and old English games, we hope to see them taught all over the country, and especi-

ally in large towns, both for their associations and for their particular brightness and jollity. It is surely a good thing to enliven the drab lives of so many of our children in the slums; and if this can be done by giving them something better to sing than the unspeakably inane music-hall songs which are the only things they hear outside the school walls, that too must be all to the good.

N.U.T. NOTES.

BY ALLEN CROFT.

DURING my fifteen years' service at Russell Square, I have naturally witnessed many enlargements and developments of Union activity, and certainly one of the most important of these was the formation, nearly a year ago, of the "Secondary Schools Committee," consisting of sixteen members of the Executive and twenty-four members of the N.U.T. engaged in secondary schools. Whatever doubts of its utility existed in May 1909 have been effectually dispelled by the admirable work done by the Committee in its initial year, and I, for one, am convinced that it has "come to stay." The mingling of teachers in primary and secondary schools round a common table has not only enabled each section of the profession to understand the other better, but has probably resulted in a material broadening of the outlook and views of both; and I candidly confess that I, personally, am glad of the opportunity of exchanging views with Mr. A. L. Cann, B.A.; Mr. W. Dyche, B.A.; Mr. J. W. Iliffe, M.A.; Mr. J. Lewis Paton, M.A.; Mr. J. Thornton, M.A.; and Mr. Hugh Watson, B.A.—to mention but a few of the prominent men on the secondary side. The one drawback from which the Committee has suffered has been the absence of its regular chairman, who (for reasons quite beyond his control) has been able to preside only once during the year. It was with the single desire of honouring the Committee that the Executive appointed the President of the Union as its chairman; but I am not alone in thinking that a man like Mr. George Sharples (member of the Lancashire Education Committee and the Consultative Committee of the Board of Education), who could, and probably *would*, devote his splendid abilities and experience to the work, would be a wiser selection than the President of the Union, who varies, necessarily, from year to year.

The Secondary Schools Committee.

"Co-ordination of Elementary and Secondary Schools" was the first and most important subject discussed at the Committee's first meeting, and I am not a little proud to think that the recommendations of the Secondary Schools Committee were practically identical with those of the Education Committee of the Executive, which gave exhaustive consideration to the same topic during the Christmas holidays. The superannuation of secondary school teachers also came under review, and I am hopeful that this eminently desirable object was advanced a stage as the result of the deliberations of the Committee.

* * *

YEAR by year the *entente* between the Executive and the Principals of Training Colleges is deepened and strengthened; and about the time these "Notes" will see the light—to be perfectly accurate, on February 25—the second Conference between representatives of the Executive and the Principals will take place in the Board Room of the Union's offices. Already some fifty of the Principals have signified their intention of being present at the Conference, and it is a matter of regret that the exigencies of space limited the Executive's representation to twelve only. The *pièce de resistance* is the "Attitude of the Board of Education towards Degree Course Students"—an attitude which is, to most educationists, as incomprehensible as it seems unalterable. Why a student who has matriculated on entering a training college, and is certified by the college authorities as suitable to proceed with a degree course, should not be allowed to do so in every case, is known only to Sir Robert Morant and his lieutenants.

Conference with Training College Principals.

"The Employment of Ex-Students" and "The Discontinuance of the Acting Teachers' Examination" are other subjects selected for consideration; whilst, if time permit, the question of the qualifying examinations for admission to a training college will also receive attention. Those taking part in the Conference will be entertained at luncheon—probably at the Holborn Restaurant—and the whole of the arrangements are in the hands of Mr. Ernest Gray, M.A., the very capable secretary of our Education Committee.

Papers for Teachers of Infants.

A TALE FOR THE STORY HOUR.

HUMPTY-DUMPTY.

THIS is a very funny tale — a topsy-turvy sort of story, that won't let itself be told properly. It is always getting itself "into a muddle," and getting you "into a muddle" too. If I decide that I really will begin, and at the very beginning too, I find that I am half-way through, and that I haven't told anything, and also that I have got so "mixed up" that it doesn't seem to be either the middle or the end or anywhere else. Sometimes I think it better to start at the end and go backwards, as children sometimes do to find the right page in their books; but I've always been told that *that* is not a good way at all. As I don't know where to begin, I'm just starting anywhere, as you have to do sometimes when you say your tables.

I think he was a boy—a very fat boy—fatter than any boy you or I have ever seen. He liked to do two things. One thing he liked to do was to eat; the other thing he was very fond of doing was sleeping; and he was fond of nothing else at all.

I cannot tell anything more about him, for I don't *know* anything. Where he lived is a mystery, and a very unusual kind of mystery, for it will never be "cleared up," as they say in the newspapers. How old he was I can only guess. I shouldn't say he was a very big boy, or yet a very little boy, but just an "in between" sort of boy. I don't even know his name—at least, not his proper name. The one I know is one that I think must have been given him because he was so fat; it is Humpty-Dumpty. The rhyme which is written about him tells us that he sat on a wall.

I expect you will say now that it seems as though he did three things, but *I* don't think that. I imagine that he sat on the wall while he was occupied with his eating and his sleeping.

The wall was a very pleasant one, not high and not low, but just "in between," like the boy. It was a garden wall. When you sat upon it the way Humpty-Dumpty sat, you could see nothing but lovely fruit trees all around you; and whenever there was a mouth open—as there often was in Humpty-Dumpty's day—a delicious apple or pear, or something equally nice, very kindly dropped in. If you opened your eyes wider—which this fat boy Humpty-Dumpty seldom did—you saw a very long, winding road, that looked as though it could take you somewhere very nice, and on each side of it the largest and most tempting-looking fields that could possibly be.

Altogether Humpty-Dumpty seemed to have chosen an exceedingly nice place to live in—or, perhaps, I had better say to live *on*. There is only one question that I feel rather inclined to hesitate about, and that is, "Was it comfortable?" We know that if it were the ordinary kind of wall, built with bricks and mortar, however comfortable it might be at first, after a time it would be apt to become uncomfortable.

Of course, when one thinks again—and second thoughts are supposed to be best—it couldn't have been an ordinary wall, for it didn't stand round an ordinary garden or have an ordinary boy sitting on it. This is one of the places where we "get into a muddle" again: we can't find out what had been used to make the wall. My opinion is that, whatever it was like, it behaved very much as everyday brick walls do in this matter.

Humpty-Dumpty was very comfortable for a very long time—much longer than an ordinary boy, of course—but one day he suddenly felt *uncomfortable*; and it was such an extraordinary feeling he couldn't understand it. I fancy that he wriggled and wriggled, first tried his legs on this side, then on that, and that this being an unusual thing for him to do, he managed it very badly indeed, and promptly fell off the wall altogether.

This must have happened at night, when the fairies and gnomes were awake, for it caused great consternation (that's a polite way of saying that everybody was very frightened) among them. The fairies talked to their friends the gnomes, and the gnomes chattered back to *their* friends the fairies; and very shortly a party of six gnomes might have been seen running along that nice road on the other side of the wall. Their long, pointed boots made such a dust on either side of them, and very soon they were quite hidden by it. Before you could have counted "ten" they had arrived at the king's palace and told him all about it.

"This is a dreadful catastrophe," said the king. He said this very slowly, especially the last long word, to frighten the gnomes and his soldiers and anybody else who happened to be about. The gnomes asked "what was to be done." The king didn't really know, but he wasn't going to tell *them* that; so he pretended to think extra hard. The messengers were very impatient, but they dared not speak; they could only watch and listen. At last the king opened his eyes and then his mouth, and said, "He must be picked up again." The gnomes shook their heads. Who was going to do it? The king ordered out all the soldiers and horses he had, and, of course, that was a very great number.

There was a great stir all over the palace. The men were awakened first; then they went and roused the horses, put on their straps and buckles and such like things; and away they all went down the road. The gnomes ran on in front to show the way. The garden was in great confusion; there was such a crowd of fairies round Humpty-Dumpty, and these had to be cleared away.

The soldiers then set to work. They brought out ropes, straps, planks of wood, and lots of other things. They worked until the moon went down and the sun rose up, but they never moved Humpty-Dumpty the least bit. They never even awakened him. At dawn the fairies went reluctantly and sadly back to their homes, and the soldiers galloped off in a very bad temper, because they knew they would have to come back the next night.

They were wrong in that, however, for the next night Humpty-Dumpty *wasn't there*. Where he had gone nobody knew, and everybody wondered. The fairies didn't know, and we don't know; so now you see why this tale is such a mystery. Some people have wondered about it so much that they have decided that there never really was a boy at all; but *we* know that he was called Humpty-Dumpty, and that he sat on a wall.

TUTORIAL COLUMN FOR THE ELEMENTARY CERTIFICATE OF THE NATIONAL FROEBEL UNION.

INTRODUCTORY.

THE following questions have been set in previous years at the National Froebel Union Examinations. A list of the centres of examination was given in the February issue.

A report is issued annually, containing the reports of the examiners, copies of the examination questions, and the examination results, price 9d. Extracts from these reports will be published in this column for the help and guidance of students.

1. *Knowledge of Child Nature.*

Examiner's Remarks.—It must be borne in mind that this is a subject upon which modern science is throwing much new light. Text-books need revision, for the physiological side of development is assuming ever-increasing prominence.

(1.) What do you know on the subject of fatigue in childhood? How can symptoms of fatigue be detected in children at kindergarten age?

(2.) For what indications of deviations from health are you on the watch as the children assemble for morning school? State briefly your reasons for attaching importance to these symptoms.

(3.) Give four examples of school methods which may (*a*) promote, (*b*) arrest, normal development in the infants' school. Illustrate, if possible, from your own observations.

4. What difficulties do we find in observing children's minds? Describe some attempts of your own, and state the conclusions at which you arrived. What seemed to you to be the possibilities of error in these conclusions?

2. *Practice of Education in Kindergarten and Transition Classes.*

(1.) What principles would guide you in (*a*) choosing a story, (*b*) choosing material to illustrate a lesson on number? (State age of children.)

(2.) What are the general characteristics of the stories in which children delight? State briefly how you would tell a story to young children; and give your opinion on the practice (*a*) of questioning the children throughout the lesson, (*b*) of allowing them to ask questions.

(3.) To what extent would you employ (*a*) myths and fairy tales, and (*b*) stories of everyday life, in teaching young children? Give full reasons for your answer.

(4.) Discuss by what means a class of children can be encouraged to take an active part in history and literature lessons.

3. *Class Teaching.*

The following extracts from the examiners' reports on the above subject are well worth careful study by intending students.

Nature Lessons.—Although children were brought into contact with the "real thing," candidates constantly attempted to elicit deductions beyond the children's capacity; forced their observations along predetermined lines, to the lessening of interest and spontaneity; or unsuccessfully attempted, with blackboard diagrams and narration, to compete with the overpowering interest of the "real thing." A few teachers only, having brought the children to Nature, allowed them to freely study and enjoy her. There was a certain amount of observation, mostly prompted by set questions with very little freshness of treatment, and a tendency to treat living plants and animals merely as objects, without reference to their independent life in their own environment. "Give every child a specimen" seemed to be considered enough. As a rule, far too much was attempted, far too much ground superficially covered. The informational method is still too much in vogue. Very young children are still told that the daisy is a multitude of florets, and other microscopic details are given.

Stories.—Some candidates in their anxiety not to emphasise the moral unduly, were apt to ignore it—showing that they scarcely appreciated the unity and beauty of the stories they had chosen. The biography of a plant or animal was far too often made to do duty for a story. In other cases, feeble stories were selected, because they seemed to offer some point of correlation, and had attained in some way to the dignity of print. It is a pity that stories are so much broken up with drawing or exhibiting useless illustrations. Candidates should discriminate between those that are needed and those that only cloy imagination and spoil the story.

Games.—There was little or no preparation for the games in the way of stimulating the children's imagination, and no dramatic effort could be seen either on the part of the children or the teacher. The connection of the game with the story or lesson was usually very forced and artificial, and the "play spirit" was often wanting.

Handwork.—In the drawing and brushwork lessons the teacher interfered too much, frequently hindering the children by requiring formal strokes and brushmarks. The occupation lessons were frequently too mechanical in method, the children's work being purely imitative. The class teaching, on the whole, was very mediocre, very little originality was shown, and no attempt to allow the children scope for free self-activity was made. There was a tendency to regard the prepared lessons as a set exercise which must be carried through in all its details, irrespective of the play of thought which might be developed in the course of it. Method still needs much revision in the light of modern psychology.

4. *Blackboard Drawing.*

(1.) *Memory Drawing.*—

(i.) *Plants.*—Daisies or mushrooms, or elm leaves, or pears, broom or celery, or geranium leaves, or acorns; dandelion or barley, or hawthorn leaves, or cherries.

(ii.) *Animals.*—Goat or moth, or limpets, or hen; bat or frog, or mussels, or robin; donkey or bee, or haddock, or pigeon.

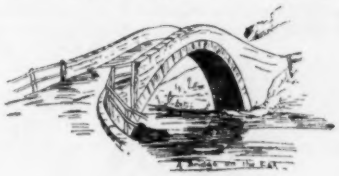
(iii.) *Objects.*—Door-key or purse, bag or book, hammer or rake.

(2.) *Model Drawing.*—Draw from models placed before you a large box, with its lid propped open by a roll or small cylinder. (Eye-level must be indicated.)

(3.) *From Nature.*—Sketch from Nature (enlarged) the spray of fuchsia, or snapdragon, with which you are provided. Show on corner of sheet the actual size of one of the flowers.

(4.) *Free Illustration.*—Make one illustration which would be useful either in a lesson on the postman and his work, or in a story lesson on Hiawatha's childhood.

(5.) Make an enlarged drawing of the sketch given below.



5. *Nature Knowledge.*

(1.) *Plant Life.*

A. (i.) Describe the *bud* in winter, and the method of unfolding in spring of the oak, beech, sycamore. Illustrate with sketches.

(ii.) State the special points in a course of four lessons to children of seven on buds in winter.

(iii.) Explain how you would make a class of children of seven or eight acquainted with the germination of a seed (bean or sycamore). Say what material you would need, and indicate clearly how you would use it.

B. (i.) Explain the formation of hoar-frost and snow, rain and ice. Describe the appearance and structure of a sn wflake.

(ii.) Why do water-pipes sometimes burst in the winter? What precautions should be taken to prevent this happening?

(iii.) A bottle, half-filled with fluid and lightly corked, is placed close beside the fire. After a few minutes it shoots out its cork. Why? Explain what physical facts are illustrated by this little experiment.

(2.) *Animal Life.*

(i.) Give the characteristics of the class Amphibia. Name the amphibians of Great Britain, and give the life history of one.

(ii.) Give as complete a list as you can of the wild mammals, reptiles, and amphibia found in the British Isles.

(iii.) Children often imagine that lions, wolves, and other dangerous wild animals are still to be found in this country. Draw up two lists for hanging in classroom; (*a*) to include *wild* mammals and reptiles now found in British Isles; (*b*) to include *domesticated* mammals. Place a star against those considered dangerous in list *a*.

(iv.) Compare the two groups, horses and cattle. In what ways have they been modified by domestication?

(v.) If you had a small class of boys from six to eight years of age, and if you had provided each with a sparrow, or other bird, killed by cold, what exercises would you give them in regard to the birds' external characteristics if you wished to develop *precision of observation?*

6. *Educational Handwork.*

(1.) An examination regulation in connection with brush draw-

ing is: "The work must be done direct from the object." What is the significance of this as a teaching maxim?

(2.) Describe what you consider to be a good type of painting lesson for children of about five and a half who have overcome the first difficulties of manipulation.

(3.) How would you answer the objection that, if drawing and painting are included in the curriculum, it is unnecessary to have modelling?

(4.) Undue interference on the teacher's part, and unguided licence on the child's part, are the two possible extremes of a drawing lesson. How can they be reconciled?

(5.) Describe the various ways in which you could use the brush as a tool in illustrating your lessons. Suggest the kinds of subjects that could be so illustrated. What exercises with the brush would you give to children under eight?

A CORRELATED SCHEME BASED UPON ÆSOP'S FABLES.

BY THE HEAD MISTRESS OF ST. WILFRID'S INFANTS' SCHOOL, HULME, MANCHESTER.

"The Lion and the Mouse"

ONE hot day a mouse ran over a lion who was asleep under the shade of a tree. The lion, enraged at being disturbed, raised his paw to crush the offender. The poor mouse begged hard for mercy, saying it was beneath the dignity of such a lordly beast to kill an insignificant mouse, who could not make one mouthful for him. The lion let her go, and the poor mouse,

full of gratitude, said she hoped that some day she would be able to repay his kindness. This speech made the lion smile. Some time after the lion got caught in a strong net. The mouse, hearing his roars, ran to see what was the matter. Running up to the net, she began to gnaw the cords, and worked so well that at last she set the lion free.

Reading.

Æsop's Fables. "A. L. Bright Story Reader."

Object Lesson.—The Lion.

Illustrations.—Picture and model of lion. Sketches of claws, sheathed and unsheathed.

Preparation.—Connect with tale.

Presentation.

1. *Habits*—By questioning on the tale, make children suggest—

(*a*) *Lion was about to eat* mouse, and so teach fact that lion is a flesh-eating animal.

(*b*) *That lion was asleep* during day. Teach method pursued in catching prey.

(i.) *Stealing* out at dusk.

(ii.) *Hiding* near spring or stream to watch for animals that come there to drink.

(iii.) *Springing* on prey.

2. *General appearance and structure.*—Points to be noted.

(1.) *Colour.*—Resemblance to surroundings should be noticed, and children should be made to suggest reason.

(2.) *Structure of eyes taught* from sketches. Reason of structure and resemblance to eyes of cat should be noted.

(3.) *Structure of claws* taught in same way.

(4.) *Whiskers or feelers.*—Explain how these feelers help the lion when moving about after dusk. If he strike these feelers against any obstacle, he knows at once that there is not room for his body to pass.

Reading.

Have you a cat at home? Yes. Well, did you know that the cat, the lion, and the tiger are cousins? You would not like to keep a lion in your house, I know; but you are not afraid of pussy, for she is tame, and will not hurt you. The little mouse that lives in the hole behind your cupboard is just as much afraid of the cat as you are of the lion. She knows well that if pussy sees her she will catch her with her sharp claws and eat her up. The cat watches the mouse's hole just as the lion watches by the spring for its prey.

Recitation from "The Glove and the Lions" (Leigh Hunt).

Ramped and roared the lions, with horrid laughing jaws;
They bit, they glared, gave blows like beams, a wind went with their paws;
With wallowing might and stifled roar they rolled on one another,
Till all the pit with sand and mane was in a thunderous smother.
The bloody foam above the bars came whizzing through the air:
Said Francis then, "Truth, gentlemen, we're better here than there."

Object Lesson.—The Harvest Mouse.

Illustrations.—Picture of mouse. Sketch of paws. Sketch of harvest mouse and nest.

Preparation.—Connect with tale. By questioning, bring out clearly—(*a*) That the mouse which helped the lion did not live in a house; (*b*) that the common mouse does live in houses. Tell children that the mouse which lives in the open air is called "the harvest mouse."

Presentation.

1. *Description.*—The harvest mouse is the smallest of all quadrupeds—belongs to the family of gnawers (rodents).

2. *Structure.*—By careful examination of the picture lead children to note—

(*a*) *Body*, long and flexible. By drawing on children's personal experience of how the mouse climbs, jumps, creeps, lead them to suggest that the mouse can bend its body easily.

(*b*) *Head*, triangular, tapering.

(*c*) *Eyes*, very bright and large; quick to see.

(*d*) *Ears*, large; quick to hear.

(*e*) *Whiskers, or feelers.* Explain how necessary these are to enable the mouse to move about safely in the dark.

(*f*) *Front teeth*, curved, long, broad, flat, edge like a chisel.

(*g*) *Legs*, hind legs longer than the fore legs.

(*h*) *Paws.* Toes are long, thin, and armed with very sharp claws. Hind paws, when spread out, look very like hands. (Show sketch.)

(*i*) *Tail*, long and flexible.

(*j*) *Skin*, covered with soft fur. Tell children the fur of the harvest mouse is of a reddish-brown colour.

3. *Habits.*—

(*a*) *Lives* in the open air.

(*b*) *Builds* nest of grass, moss, and leaves, and fastens it to the stems of wheat or other plants. Explain (1) how the forma-

tion of its teeth enables it to gnaw or cut off the grass, etc., in little slices; (2) how the sharp claws and handlike formation of its paws enable it to climb; (3) how it twists its tail round the stems, and so keeps its balance.

(c) *Eats grain*, seeds, nuts, acorns, etc.

(d) *Makes winter nest* in a hole in the ground.

(e) *Stores up food, and sleeps* during the greater part of the cold weather.

Reading.

Mr. and Mrs. Harvest Mouse were very busy one hot summer day. They ran up and down a big stalk of wheat, with a leaf or stalk of hay or bit of moss in their mouths. At last they had made a nice round nest, which was fastened to two big stalks of wheat. This nest made a nice safe place for their four babies. They were very proud of these babies, and took great care of them, till they grow too big for the nest. Then one fine day, Mr. Harvest Mouse helped them out of the nest, and they had

a fine time in the wheat field. They learned how to gnaw the ears of wheat with their sharp little teeth. When summer was over, Mr. Mouse said, "It is time for us to look for our winter home." So they found a nice hole, and lined it with moss and leaves, and for a few weeks they were very busy carrying grain and acorns down into it. When the cold, wet weather came, they all crept down, and were quite cosy and warm there till next spring.

OBJECT LESSON.—FLAX.

Illustrations.—Flax in various stages of manufacture. Picture of flax plant. Linseed.

Preparation.—Connect with tale, bringing out how lion was caught.

Presentation.—Let children break a stalk of dried flax, and

BRUSH WORK.

note how the fibres resemble the fibres of string. Show picture of flax plant, and let children suggest difference between stalk seen in picture and stalk they are examining.

Describe *sowing* of flax; *pulling* up by the roots when ripe; *steeping* and drying; *beating*.

Show specimens of tow—combed flax—spun flax, and make children note differences.

Reading.

One day all the boys in our class had such nice clean collars that teacher gave us a lesson on how our collars were made. She showed us a picture of flax, with its pretty blue flower, and gave us some of the little brown seeds. I sowed some in my garden, and they grew very well. Teacher showed us some dried stalks, and let us pull the threads. She told us how linen was made from these threads.

Recitation.

"THE FLAX."

The flax, the flax, the fairy flax,
How I love to see it grow!
The slender stalks, with feath'ry leaves,
Go swaying to and fro.
And dotted o'er, so thickly o'er,
The waving sea of green,
Like flecks dropped from the summer sky,
The bright blue flowers are seen.
They nod, and bow, and dance about
To the breeze's merry tune.
I do not know a fairer sight
Than a field of flax in June.

OBJECT LESSON.—CORD.

Illustrations.—String, cord, rope, pieces of each.

Presentation.—Let children have small pieces of each, and by exmination see—

(1.) *That string is* made up of a number of fibres twisted together.

(2.) *That cord is* made by twisting a number of strings together. Impress that strength is due to the twisting of the fibres.

Writing.

This picture of the lion and the mouse shows us how the tiny mouse was able to save the big lion. The mouse did not forget how the lion had spared her life. She made good use of her sharp teeth, and cut through the net in which the poor lion had been caught.

THE PROGRESS OF ESPERANTO.

SINCE the idea of Esperanto first saw the light in a little book published by Dr. Zamenhof in Warsaw in the year 1887, this auxiliary language of the nations has suffered some vicissitudes. Attacked, ridiculed, and belauded by turns, it made many vigorous enemies and many warm friends. Having survived the attacks of critics, it is now generally admitted to be a useful addition to the means of international communication. So great has been the increase in the number of Esperantists of various races in recent years that firms whose clientèle lies among the educated and professional classes are issuing descriptive literature in this language. Burroughs, Wellcome, and Co., the manufacturing chemists, for instance, now publish a circular dealing with some of their preparations in Esperanto, and this should be of interest to all students of the language.

LITERARY NOTE.

MESSRS. J. M. DENT AND SONS, LIMITED, will shortly add to their well-known "Modern Language Series" a French verb book by Miss C. F. Shearson, recently appointed H.M. Inspector of Schools.

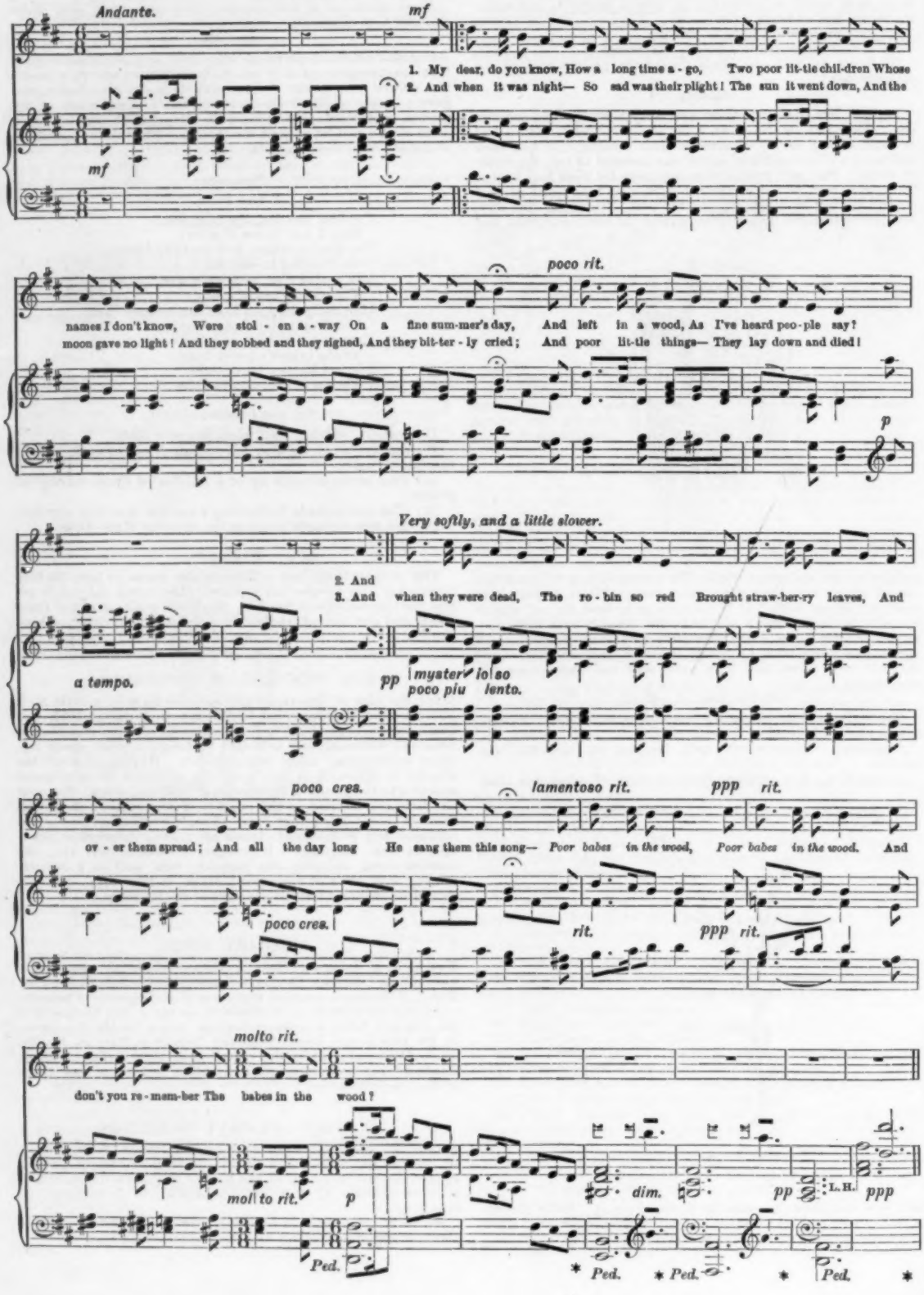
Among other books to be issued at an early date by this firm are *Aus den Leben*, a series of German scenes for the classroom, by Dr. Hirsch and Stuart Walters; *Tony et sa Sœur en France*, by J. Duhamal; while the reception of their "Short French Readers" has encouraged them to add a number of new titles to this excellent series.

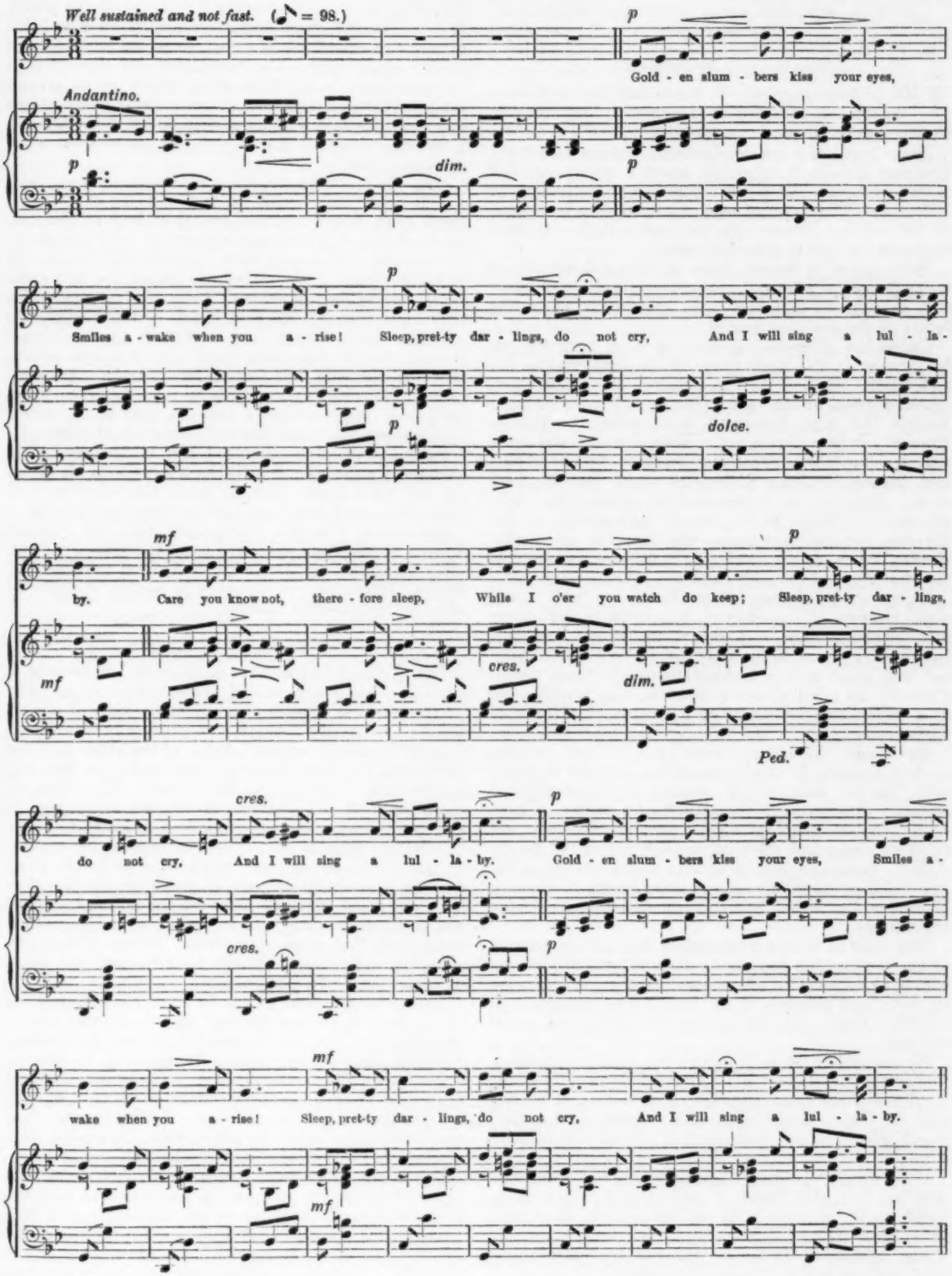
SCOTTISH ASSISTANT SECRETARY.

FOLLOWING upon the retirement of Mr. George Todd, I.S.O., Mr. George Macdonald, M.A., LL.D., is promoted to the post of First Assistant Secretary of the Scotch Education Department, as from January 1, 1910, with headquarters, as hitherto, in Edinburgh.

Mr. G. W. Alexander, M.A., Clerk to the School Board of Edinburgh, is appointed Second Assistant Secretary (in London).

"THE BABES IN THE WOOD."

Old Nursery Rhyme. *Music by* THOS. J. HEWITT.

Andante.
mf
1. My dear, do you know, How a long time a - go, Two poor lit-tle chil-dren Whose
2. And when it was night— So sad was their plight! The sun it went down, And the
mf
poco rit.
names I don't know, Were stol - en a - way On a fine sum-mer's day, And left in a wood, As I've heard peo-ple say?
moon gave no light! And they sobbed and they sighed, And they bit-ter - ly cried; And poor lit-tle things— They lay down and died!
p
Very softly, and a little slower.
2. And
3. And when they were dead, The ro - bin so red Brought straw-ber-ry leaves, And
a tempo.
pp
mysterioso
poco piu lento.
poco cres.
lamentoso rit.
ppp
rit.
ov - er them spread; And all the day long He sang them this song— Poor babes in the wood, Poor babes in the wood. And
poco cres.
rit.
ppp
rit.
molto rit.
don't you re - mem-ber The babes in the wood?
molto rit.
p
dim.
pp
L. H.
ppp
Ped.
Ped.
Ped.
Ped.

ANON. **"GOLDEN SLUMBERS."** *Music by* F. H. SQUIRES, F.R.C.O.

Well sustained and not fast. (♩ = 98.)
Andantino.
Gold - en slum - bers kiss your eyes,
Smiles a - wake when you a - rise! Sleep, pret-ty dar - lings, do not cry, And I will sing a lul - la -
by. Care you know not, there - fore sleep, While I o'er you watch do keep; Sleep, pret-ty dar - lings,
do not cry, And I will sing a lul - la - by. Gold - en slum - bers kiss your eyes, Smiles a -
wake when you a - rise! Sleep, pret-ty dar - lings, do not cry, And I will sing a lul - la - by.

MODERN SCIENCE NOTES.

BY J. G. M'INTOSH, B.SC., SECONDARY SCHOOL, GATESHEAD.

The End of Everything.

THE ultimate end of all things has always been a matter of considerable speculation and interest to scientists in all ages.

Some time ago I noticed in these columns a book by Professor Lowell, in which he draws a sensational and rather terrifying picture of the ultimate destruction of the earth. The cause of such a catastrophe he assigns to the collision between the sun and a dark star wandering at random in planetary space.

From Lowell to Seneca, tutor of Nero and scientist of a bygone age, is a far cry, yet in the very dawn of scientific inquiry we find the same speculation as to the future of the world we live in.

Quæstiones Naturales appears to have been written by Seneca at the time when he was anticipating his own death. He had risen to eminence as a philosopher, amassed great wealth, and as tutor and guide to Nero become the most important man under the Roman Empire. In him men saw the dawn of a new and great era of virtue. When that era proved to be one of vice and licence, Seneca's philosophy stood him in good stead. Too late to withdraw from public life, daily menaced by death, he set himself to meditate on the universe and its phenomena—the sun, the sea, earthquakes, floods, comets, and all the amazing and terrible manifestations of the gods to men.

In the study of these things, Seneca probably found some measure of consolation. Certain it is that, however much he may have shared the stoical contempt for physical science in his early life, he now applied himself with great fervour and enthusiasm to these things. Probably his mind always inclined in this direction, for as a young man he published a tract on the study of earthquakes.

Quæstiones Naturales excites the interest of the modern scientist in two ways—firstly, because it represents the last word of the classical world on physical science; and secondly, because Seneca seems to have been "the sole fountain whence natural philosophy derived its source and drew its supplies during the Middle Ages." Montaigne speaks of him and Plutarch as his two teachers. Aristotle only became known to Western Europe in the twelfth century, and that through Arabic translations.

This work of Seneca is interesting, not only on account of his own theories and explanations of natural phenomena, but because of his references to the theories of others; its occasional glimpses of the luxury and corruption of Imperial Rome; and its practical wisdom and moral eloquence.

No one can doubt, he says, that the rainbow is a reflection of the sun, formed in a hollow cloud full of moisture.

"I am of the same opinion as Poseidonius, in holding that the bow is formed in a cloud shaped like a hollow, round mirror, whose form is that of a section through a ball."

"Lightning," he says, "freezes wine; and when wine that has been thus frozen is used after it returns to its liquid state, it either kills or drives mad those who have drunk it."

The opinion of Thales on the relation between the earth and the sea he dismisses as foolish.

"The whole earth," he says, "is upborne by water, and floats just like a boat. When it is spoken of as trembling, it is rolling by the movement of the water. It is no wonder, then, that there should be abundance of water to pour forth in rivers, since the world is itself wholly set in water. You should put out of court such an antiquated, unscientific idea. There is no ground for believing that the water comes in through the chinks in the earth's sides and forms bilge-water in the centre."

Seneca's vision of the end of the earth is an overwhelming flood.

"In the first instance, there will be excessive rainfall; a dull, leaden sky, with never a glimpse of the sun. Crops begin to rot; shrubs lose their hold in the softened soil; roofs fall in, and homesteads are swept away. Cities perish in the rising flood. Rivers reach the middle of the mountains. Soon they are lashing the very summits, and bearing down with them the mountain-sides they have flooded. All that is left of the human race gathers with its herds on the highest mountain-tops. Brought to the last shift, they have this one solace, that apprehension has passed into stupor. Astonishment so fills them that there is no room for fear. Even grief finds no place; for it loses its force in one whose wretchedness has passed beyond perception of suffering."

Such a description, dignified and melancholy, probably reflects the mental attitude of Seneca to his times. On the other hand, there is much that may be read with gaiety, and even with bewilderment, in the book.

Quæstiones Naturales, under the title of *Physical Science in the Time of Nero*, has been recently admirably translated by J. Clarke, M.A., and published by Messrs. Macmillan. Sir Archibald Geikie contributes notes on the scientific theories.

The Teaching of Science.

The editor of *Engineering*, in the issue for January 7, has some very pertinent and apposite remarks to make on the teaching of science in the newer type of university and university colleges now practically established in great industrial centres. Much of the study in these universities he condemns as a weariness to the flesh and a regrettable waste of time and money. The wholesale importation of the methods of the old universities is singularly ill-adapted to the functions which these newer foundations have to fill. The chief reason for the existence of this newer type would seem to be the local training in scientific subjects of men who, for the most part, are going to apply their science in the industrial and commercial world. It is, therefore, of the greatest importance that these men should receive a scientific education sufficiently thorough to withstand the stress of application in commercial work.

The writer therefore pleads for more consideration for the student of average intellect, who constitutes a large percentage of the raw material of these institutions. Research students may, generally speaking, be allowed to work out their own salvation. The writer therefore urges that in choosing the members of the staff of such an institution, teaching capacity should be the chief qualification, eminence in scholarship the second, particularly in the case of scientific subjects.

The argument is sound, based on common sense. In many of the newer colleges the methods and tradition have been wholly opposed to this principle. The brilliant scholar who knows how to impart his knowledge to others is, generally speaking, the exception and not the rule. The chief need is "the teacher"—the man

who has studied teaching as a science, and who, while having a thorough grasp of his subject, is able to impart it to others, and, above all, to appreciate the difficulties lying in the road of the average student.

The institution of the professorial chair generally results in the appointment of a brilliant man, who is thus exempted from the struggle for existence and left free to carry on his research work. With this policy we have no quarrel; but when this man, so obviously unfitted for the task, has to assume the additional duties of the teacher, we agree with the writer in *Engineering*, and doubt the advisability of the step. In such a case lecturers and demonstrators ought to be men of undoubtedly high teaching qualifications. We commend the concluding sentences of this article to the readers of the *Practical Teacher*:—

"After all, no one can deny that there is much nobility in teaching, as distinct from original investigation.

"Some years ago, at a university degree day, the customary oration, setting forth the merits of the recipient of an honorary science degree, concluded with the statement that the candidate was 'a generous and able exponent of the work of others.'

"Surely no higher tribute could be paid to a teacher than this, which sums up the real qualification needed for those whose high mission it is to raise the standard of education among the soldiers of our commercial army."

The Mean Height of the Antarctic Continent.

Nature for January 20 gives an abstract of the results of Professor W. Meinhardus on the estimation of the mean elevation of the central core of the Antarctic land mass, based on the distribution of atmospheric pressure, and the consequent exchange of air between the two hemispheres.

With the help of the *Fram* observations and Baschin's maps of the southern oceans, Professor Meinhardus finds that, while the mean pressure is 0·85 mm. higher in January than in July between latitudes 0° to 80° N., in the zone 0° to 50° S. it is 2·14 mm. lower. In higher southern latitudes, as far as 60° S. lat., the January pressure is 0·73 mm. less than the July, and from 60° S. to the Antarctic circle the relation is almost one of equality.

Hence, allowing for proportional areas, it follows that within the Antarctic circle the true atmospheric pressure must be 11 mm. higher in January than in July.

Observation, however, has so far failed to reveal the existence of this excess. The diminution of the southward temperature gradient, and consequent weakening of easterly winds on the edge of Antarctica in summer, render it probable that, as in the north polar region, the pressure at sea-level is actually lower in summer than in winter.

The discrepancy can be explained by assuming a mean elevation for the area within the Antarctic circle, and taking −3° and −6° as the mean temperatures for January and July respectively, Professor Meinhardus gets a value for this of 1,328 metres, or, as a second approximation with temperatures −6° and −29°, 1,350 metres, with a probable error of ±150 metres. Having regard to the proportion of the area known to be covered by sea, the land surface is taken as 14,000,000 of square kilos., and its mean height then becomes 2,000 metres, with a probable error of ±200 metres.

Recent explorations suggest that this value is not far from the truth, the covering of inland ice being, as in Greenland, an important factor. If it is approximately correct, Antarctica is the largest mass of raised land in the world. It is half as large again as Europe and Asia, the highest of the known continents, and has a mean elevation of less than half (950 metres). The accepted value of the mean height of the land surface of the world (700 metres) is raised to 825 metres, and the mean level of the physical surface of the globe from 205 to 240 metres.

Northumbrian Dykes.

A paper, highly interesting to North Country readers, by Miss Heslop, M.Sc., and Dr. J. A. Smythe, was recently read before the Geological Society on the "Dyke at Crookdene and its Relations to the Collywell, Morpeth, and Tynemouth Dykes."

The dyke at Crookdene is exposed in the bed and banks of the Wansbeck, about fifteen miles above Morpeth. It is intruded along a fault fissure in beds of Bernician age, and apparently comes to a natural head.

The basalt is characterised, microscopically, by narrow lath-shaped felspars and curved augites.

Microscopically, its most interesting feature is the occurrence of large inclusions of a felspar, which is shown by chemical analysis to be closely allied to anorthite. The exterior of the inclusions in contact with the ground mass is strongly zoned, the latter showing a slightly chilled edge. The individual crystals are intergrown, and are cracked, faulted, and in places completely shattered. In no case is the dislocation great.

These phenomena point to a plutonic origin of the felspathic inclusions, and connect them with the porphyritic felspars of the Tynemouth Dyke.

The dyke, which comes to a head in the coast section at Collywell, twenty-four miles distant, shows the same peculiarities; and chemical and microscopic examinations show them to be identical, and probably of the same intrusion. The resemblances of the four dykes are so great that it is probable they are derived from a common source.

In the Transactions of the Natural History Society of Northumberland and Durham, Mr. Gill describes a new carboniferous arachnid from the Tyne Valley. The specimen, which was obtained from the coal measures of Crawcrook, is related in some way to *Anthracosiro Woodwardii*, the two forms agreeing in the general structure of the abdominal region. In the typical species the limbs are normal, whereas in the Crawcrook specimen they are curiously flattened and expanded—so much so that their contour admits of no other explanation than that of a new species.

"Galvanit."

An interesting paper was recently read before the Royal Society of Arts, by Sir Henry Wood, on a new process of electroplating discovered by Mr. Rosenberg. The new substance, which has been named "Galvanit," is rubbed on the article which requires plating, with an astonishing result. Professor Sylvanus P. Thompson, D.Sc., who presided at the meeting, produced a pair of ancient "Japanese magic-mirrors," which had hitherto defied the electroplater's art. With a tin of the powder, a rag, and a little water, the demonstrator in a surprisingly short space of time produced a successful result. The substance can be used domestically, and is, we understand, to be placed on the market shortly. In his presidential remarks, Professor Thompson described the discovery as "so radical and novel a departure in electro-deposition that it is difficult to foresee all its possible developments."

A SCHEME OF CORRELATED HISTORY AND LITERATURE.

SCHEME FOR MARCH—THE NORMAN CONQUEST.

BY MABEL A. BROWN.

GRADE I.—STANDARDS I. AND II.	GRADE II.—STANDARDS III. AND IV.	GRADE III.—STANDARDS V., VI., AND VII.
History— 1. Earl Godwin and his sons. 2. Harold of England. 3. William of Normandy. 4. Life in Norman England.	As for Grade I., giving a more connected narrative, greater detail, and entering more fully upon the conditions of life after the Norman Conquest.	1. Normandy (the land of chivalry) and the Normans. 2. The conquest of England. 3. The laws of William the Conqueror. 4. The feudal system.
Literature (*Prose*)— The story of Harold (Lytton). The story of Hereward the Wake (Kingsley). Both to be told to the children. All teachers should read *unabridged* editions of these two books. The former, especially, embodies the whole history of this period in most dramatic and lifelike manner.	As for Grade I. Selected passages may be read aloud from the abridged editions, and composition exercises based upon them. After Hastings, from *Boys and Girls of Other Days*, is a story that will be much appreciated by children under twelve.	*Harold* (Bright Story Readers, Arnold, Leeds, 4d.). *Hereward the Wake* (Edward Arnold, London, 6d.). Both of these are abridged editions, and should be used as readers by the upper standards. The prelude to *Hereward* and first chapter of *Harold* should be read to the class by the teacher. Compositions should be written on these.
Literature (*Poetry*)— William the Conqueror, from *Ballads of British History, I.* (Nelson and Sons, 3d.). The whole of this poem may be learned by Grades I. and II. for recitation.	The Battle of Hastings, and The Curfew Song of England, from *Ballads of British History, I.*	The Norman Baron, by Longfellow, and The Burial of William the Conqueror, by Mrs. Hemans, from *Ballads of British History, I.* The Norman Baron may be learned as recitation by Grade III. during March and April.

HANDWORK.

In the "*Britannic*" *Historical Geography Books I.* (Charles and Dible. 3s. per doz.), mentioned so often before, the maps, "England at the Conquest" and "England and Normandy," will be of value both for teachers' blackboard work and for the handwork of the upper standards; while the "*Suggestions*" *Historical Drawing Cards*, by the same firm (Set B, 1s. 6d.), will provide copies for drawing for all grades. Norman archways and towers, Norman weapons and armour, are suitable subjects for freearm work, while the former provide good opportunity for shading and pencil work for the upper standards. In any large illustrated history good copies of Norman architecture, weapons, common utensils, etc., may be found. All teachers should endeavour to show their classes pictures copied from the Bayeux tapestry and from the Anglo-Saxon Calendar. These may be found in Cassell's *History of England*, Nelson's *Highroads of History IV.*, Horace Marshall's *Illustrative History I.*, etc.

PICTURES BEARING ON THIS PERIOD.

"Coronation of William I." (*A. L. Historical Cards* No. 5 Leeds: Arnold).

"Battle of Hastings" (*A. L. Historical Incidents*, No. 10. Leeds: Arnold).

"William crossing the Channel," "The Death of Harold," "Harvesting" (from Bayeux tapestry. Published by Horace Marshall. 2s. each, or 9s. 6d. per set of six).

NOTES ON THE NORMAN CONQUEST.

Children should be led to see the great changes brought about by the Norman Conquest; to contrast the characters of Saxons and Normans; and to see the vast difference in their modes of life, their ideals, etc. For young children the story of the times is told in the biographies of the three great men—Earl Godwin, Harold of England, and William of Normandy. The growth of power in the hands of Godwin and his sons should be traced, and from no better source can it be traced than in *Harold*. *History and Biography I.* (published by A. and C. Black at 2s.) also gives an excellent biography of this great man, and of William the Conqueror, besides containing many biographies that will be useful later on in the work.

Life in Norman England.—After the conquest a sharp line of division was drawn between Saxons and Normans. The former became slaves, the latter their masters. This change was brought about by different ideas regarding the ownership of land. The old Saxon ideas of bookland and folkland were disregarded, and *all* land was looked upon as belonging to the king. Thus all the common land, which the Saxons had used as grazing ground for their cattle, was now regarded as royal forest land, wherein no Saxon dare set foot under direst penalties. The wild beasts and fowl were rigidly preserved by the most stringent forest laws. So the Saxons were deprived of their right of pasture, and a great deal of their means of livelihood, at one stroke. Needless to say, they did not tamely submit, and rising after rising took place. As there was no organised, united resistance, it was easy for William to crush these small rebellions.

The northern rebellion of 1069 shows how sharp and severe William's methods were. The Norman soldiery made a perfect desert of a flourishing district, and nearly 100,000 people were left homeless and destitute, to die by thousands in the forests and on the moors.

The Feudal System.—This was established by the Conqueror. Explain the main point of the feudal system as land granted for services rendered. The owner of the land was the king, who gave vast tracts to his Norman barons for support at the battle of Hastings. These were called tenants-in-chief. They again let out parcels of land to their retainers, who were called under-tenants.

The land granted was called a feud or a fief. As William held forfeit the lands of all who opposed him, he had great stretches of territory in his gift. When a Norman baron became a tenant-in-chief, he considered all the Saxons upon his piece of land as his slaves, and made them pay a rent in labour for their small share of ground. *All* tenants, both chief and under tenants, had to swear fealty to the king direct, promising to be faithful to him *against all other men*. This was an improvement on the Continental system, where the under-tenants only swore fealty to their own feudal lord, and not directly to the king. William, like a great organiser, saw this weakness, and provided against it. He also distributed his barons' territory in different parts of the country, so that no man should have a large, compact estate in his possession. Teachers should endeavour to give their pupils a graphic account of the great assembly at Salisbury (1086), when all the tenants of the crown, of all degrees, came to swear homage to King William.

Changes in the Language.—Norman-French became the language of the court, the camp, the law, the professions, and the upper classes. English continued to be spoken by the Saxons; and in the struggle for supremacy English emerged triumphant, and enriched by the addition of many Norman words, especially where there was no English equivalent. Terms used in chivalry, in hunting, in all kinds of sports, in war, in the law, became part of the English language. Give children examples of such words in use to-day.

The following passage from *Ivanhoe* shows clearly the existing state of relations between Normans and Saxons, and gives valuable insight into the kind of modifications that took place in the language. Wamba and Gurth, thralls of Cedric, are discussing the herd of swine in the charge of Gurth:—

"'Swine is good Saxon.....and pork is good Norman-French: and so when the brute lives, and is in the charge of a Saxon slave, she goes by a Saxon name; but becomes a Norman, and is called pork, when she is carried to the castle hall to feast among the nobles..... There is old Alderman Ox continues to hold his Saxon epithet while he is under the charge of serfs and bondmen such as thou; but becomes Beef, a fiery French gallant, when he arrives before the worshipful jaws that are destined to consume him. Mynheer Calf too becomes Monsieur de Veau in the like manner; he is Saxon when he requires tendance, and takes a Norman name when he becomes matter of enjoyment.'

"'By Saint Dunstan,' said Gurth, 'thou speakest but sad truths. Little is left to us but the air we breathe, and that appears to have been reserved with much hesitation, solely for the purpose of enabling us to endure the tasks they lay upon our shoulders. The finest and fattest is for their board; the loveliest is for their couch; the best and bravest supply their foreign masters with soldiers, and whiten distant lands with their bones, leaving few here who have either the will or power to protect the unfortunate Saxon.'"

Admixture of Races.—The union of Saxon and Norman was the best thing that could happen for England, cruel though the conquest seemed at the time. The old English kings had degenerated, and a new race was needed to give it stimulus, new energy, and to bring it and keep it abreast of the times. This was provided by the Norman invasion and subsequent blending of the races, where the Saxon sturdiness, good sense, and independence was the stock upon which were grafted the greater knowledge and civilisation, the chivalric ideals, the high spirit, and the good government of the Normans.

TEACHER'S REFERENCE THIS MONTH.

Illustrative History I. and II. (Horace Marshall and Son. 2s. 6d.)

Social Life in England. (A. and C. Black. 1s. 6d.)

History in Biography. (A. and C. Black. 2s.)

Boys and Girls of Other Days. (A. and C. Black. 1s. 6d.)

Andred's Weald. By Crake. (Parker and Co. 3s. 6d.)

A FEW PRACTICAL HINTS ON THE PHYSICAL TRAINING OF GIRLS.

BY ZANTHONIA N. NESBIT, A.R.SAN.I., PHYSICAL TRAINING MISTRESS.

THE great value of the Swedish system of gymnastics is being yearly more appreciated in England, as is shown by the last Syllabus of Physical Exercises for Public Elementary Schools (1909); but it may be doubted whether the necessity for the daily practice of gymnastic exercises is yet duly understood.

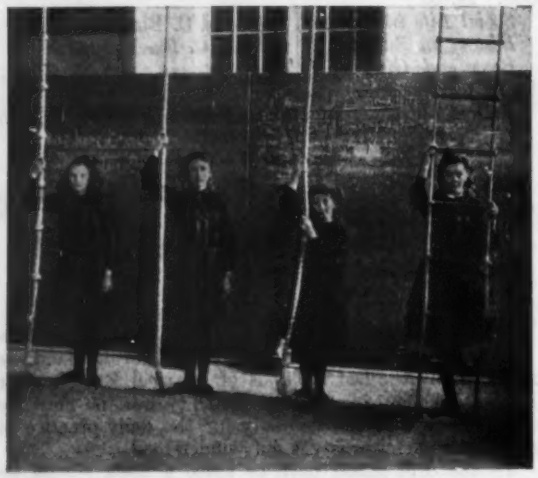
To the drill lesson once or twice a week should be added ten or fifteen minutes' daily practice. This maintains the muscular advance made in the previous lesson, and saves the girls from the aching which is often complained of after drill. It is the continued effect that is so important to the rapidly growing bones and muscles of girls and young children. It is by daily practice that strength is gained, the shoulders flattened, an erect carriage obtained, vital capacity increased, and even spinal curvature arrested, and, if taken in time, cured.

No great muscular strain should ever be imposed on the young, by giving prolonged or difficult exercises to beginners, as it is possible to overstrain the muscles, and overstrain greatly retards development. In teaching a class of girls, the object should be to develop every individual of the class into strong and graceful womanhood, not to make a few strong girls into gymnasts to win admiration at the school display.

Before taking a class the mistress should, if possible, see that the room or gymnasium is well ventilated. It is most harmful to children to be made to expand their lungs in a close, stuffy, and dusty atmosphere, as the probability of inhaling tuberculosis and other germs is thereby greatly increased. Drill should be suspended during a black fog, as the smoke contained in it is injurious to the lungs, and the exertion of drill will certainly increase the amount of fog inhaled. The floor of the gymnasium, for the same reason, should be quite free from dust, and the mats taken outside and well beaten daily, or when the class is at work their feet will raise the dust, and any impurity in it will be inhaled by the pupils.

A very simple plan for removing any dust that may have settled on the floor since the last time of sweeping is as follows: A piece of coarse canvas (4 feet by 6 feet) is attached to a stick (a broom handle does very well), and a cord attached to the middle of the stick. One of the pupils draws this over the floor, while another, with a small garden watering-can filled with water containing a small quantity of Jeye's Fluid or some other non-poisonous disinfectant, follows, spraying that portion of the canvas that touches the floor. This method

of removing dust is in use at the Chelsea Physical Training College, and gives a pleasant freshness to the hall. Care must be taken that too much water is not used, or the floor will become slippery. The canvas should be washed once a week.



CLASS IN POSITION FOR ROPE CLIMBING.

The mistress, having seen to the ventilation and dustlessness of the gymnasium, should observe the temperature, which should be 60° F. Her next care should be to see that such part of the apparatus as is movable is put up safely. For instance, the alteration in height of the horizontal bar, rings, and boom should always be performed by the mistress, who should then do the exercises she intends giving the class in order to test the security of the apparatus.

At the commencement of the class the girls should march in single file. This gives the mistress an opportunity for observing any physical defects—such as one shoulder higher than the other, which may mean *scoliosis* (lateral curvature) in the dorsal region of the spine; one hip higher than the other, which may mean *scoliosis* in the lumbar region of the spine.

Spinal curvature, if taken in time, can be cured by proper daily gymnastic treatment; but if neglected, increases. After a time *torsion* may set in, which is a twisting in the bony structure of the vertebræ themselves, and consequently the ribs, the first seven of which are attached to the sternum in front and to the transverse processes and body of each dorsal vertebra behind, are forced out of their normal position, causing a bulge at the back on the convex side of the curved spine, and a corresponding flattening in front of the chest. The reverse happens on the concave side of the curved spine, there being a flattening at the back and a bulge in front. This forces the heart and lungs from their natural positions and lessens the capacity of the thorax, seriously damaging the health, causing anæmia, chronic headaches, indigestion, shallow and difficult breathing, and bad intercostal neuralgia owing to the compression of the nerves between the ribs.

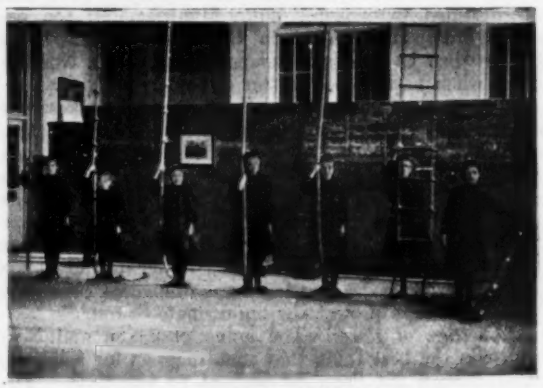
Another defect which the mistress should notice is round shoulders, sometimes accompanied by *kyphosis*, which is an increasing of the normal physiological curve in the dorsal region of the spine, and causes contraction of the chest, and thereby lessens the vital capacity and enfeebles the circulation, with the result that the pupil lacks the power for physical or mental work. Special attention should be paid to poking head, as it may be a sign of defective sight, in which case proper glasses should be prescribed, and exercises given to correct position of the head.

In these cases of physical defects, as in all others, prevention is better than cure, and a little instruction to the pupils, wisely and brightly given, with a few forcible explanatory words, may save much after-trouble. For example, children should be told to carry their books to school in one hand and home in the other. If this is not done, the weight of the books will probably, if the pupil is not very strong, pull one shoulder down, and afterwards lateral curvature of the spine may follow. The practice of carrying a heavy satchel is for this reason regrettable.

The cause of *scoliosis* in the lumbar region of the spine (shown by one hip being higher than the other) may be standing with the weight on one leg in class while reading, etc. Children should be warned of this danger, and told always to stand with their weight equally on both feet, also to strive to sit straight when writing.

When taking a class, it is advantageous, after the marching, to allow the pupils to have a run, as this improves the circulation and lets off superfluous energy, and thus tends to facilitate good discipline. The exercises should be easier at the beginning and more difficult at the close of a lesson, which should always be as bright and interesting as possible, and each lesson a progression on the preceding one. Too much stress cannot be laid upon the danger of allowing a new pupil to perform strenuous exercises—such as hanging exercises, abdominal exercises, and difficult arch flexions—before the mistress has had a doctor's report that the pupil's heart is sound. If the mistress happens to be teaching in a school that does not have medical inspection, she should ask for a doctor's certificate; and if she cannot obtain one, she should abstain from giving the above-mentioned exercises.

Great care should be taken that the children understand the value of breathing exercises, as it is difficult to make each child breathe as deeply as she is able unless she understands the benefit derived. Pupils should be



CLASS IN POSITION FOR ROPE CLIMBING.

taught not to hold their breath while they are doing an exercise, as, if not checked, it will become a habit which is very injurious. A mistress can ascertain whether a child is holding her breath by her face becoming red.

In running it is very beneficial to teach the children

to regulate their breathing. They may be told, when beginning to run, to breathe in for three steps and out for three steps, and then breathe in again for three steps, and so on, while running. When this habit is acquired, it will be found that the pupils are longer winded. If three steps require too long a breath for any child, let her breathe in for two steps; if too short, let her breathe in for four steps—the point being regularity. If at the end of the run the children are asked individually how many steps they took to a breath, they will be more interested in the exercise.

Wherever possible, gymnastic dress should be insisted on, as many exercises cannot be given if it is not worn; and, moreover, pupils are much less likely to meet with accidents when wearing suitable dress than when wearing garments that impede their movements. A special warning should be given as to the dangers of tight clothing. Unsuitable dress causes extra fatigue to pupils, and therefore this must be remembered while teaching them. The difficulty of gymnastic shoes in elementary schools in poor districts is very great. It is very desirable that indiarubber shoes—the cost of which per pair is very small—should be allowed to each class to wear for the drill lesson.

BALANCE EXERCISE.

Two pupils balance walking, three steadying the boom.

Organised games should be encouraged in every school, as they encourage comradeship, unselfishness, pluck, and self-control. Where possible net-ball and hockey matches should be arranged between different schools, and the children encouraged to treat the visiting team with hospitality and to regard them as guests, not opponents merely, to play for the sake of the game, and to learn to accept defeat with good humour.

After a game girls should always put on thick jackets, and, if possible, warm jerseys. It should be impressed on their minds that this is always done by athletes after matches.

Every physical training mistress should have an ambulance basket; for though it may be hoped that, by care in testing apparatus and holding pupils when they learn new exercises, no serious accidents will happen, yet trifling ones will sometimes occur in games and running, such as bruises, cuts, and grazes. The latter should always be well washed and bound up with some antiseptic. The following equipment will suffice for all ordinary occasions: scissors; forceps; roller bandages in three sizes—1″, 1½″, 2″; triangular bandage; boracic lint; ordinary lint; cotton wool; strapping plaster; permanganate of potash; friar's balsam; sal-volatile; safety pins; medicine glass.

This basket should be kept sealed, and every time after use the physical training mistress should see that any material that has been taken out is replaced and the basket sealed again ready for the next emergency. This ensures everything being in its place when wanted, otherwise it may be found that the particular thing required has been used up.

"A strong, healthy, harmoniously developed body under the perfect control of the will"—such is the true aim of physical training, such the lofty aim for which the physical training mistress strives in her daily work; and, first and foremost, let her beware of "despising the day of small things." It is by the small things she will triumph. The hourly watchfulness over her pupils; the keen eye to mark the first sign of anything amiss; to discern between laziness and weakness in the drill lesson, sulkiness and headache, and so act as to maintain the discipline of the class with due regard for the individual; to know the power of every child in every class, and to give it enough physical work for its development—enough and not too much; to know how and when to give rest;—these are some of the cares of a physical training mistress.

THE FUNDAMENTAL PRINCIPLES OF THE TEACHING OF NUMBER.

A LONDON CONFERENCE.

THE fact that teachers are willing to spend a part of their holiday in the discussion of educational topics shows that they are really keen on their work, and also that there are plenty of ideas abroad. There is, indeed, at the present moment an educational ferment which cannot but lead to greater efficiency. However, if much of this enthusiasm is not to be abortive, it will be necessary to guard against purely destructive criticism of method. It is easy to point out faults and to hold obvious defects up to ridicule, but discussion must not be confined to lament and invective. Conferences for the discussion of method suitable to any particular subject are only feasible when those who take part in them look at the subject from many and various points of view. One of the most interesting sessions of the London County Council Conference this year, held on the 6th, 7th, and 8th January, was devoted to the "Teaching of Number." Professor J. Adams, Principal of the London Day Training College and Professor of Education in the University of London, presided. He stated in his opening remarks that the subject was one of great practical interest, and that there was a large variety of ways of dealing with the elementary teaching of number. Most practical teachers thought that their own way was the correct way, but it was well to know that there were other ways. What a difference a good method makes to the child. He said that those at headquarters were concerned lest many of the methods now adopted were not producing good results. It was important that they should consider on first principles the lines they were going to follow in this subject, the presentation of which in its elementary stages was even more difficult than in advanced work. Mr. T. Raymont,

Vice-Principal of the Training Department of the Goldsmiths' College, then read a paper on "The Teaching of Number." He said that teachers might look with suspicion upon a paper dealing with theory rather than with practice. But it was only when theory had been granted that practice could be gained. It was important that we should carefully consider what is, or should be, the aim of our teaching, the fundamental principles on which it is based, the first steps to be taken, and by what method the teacher should seek to lead on. The object of number teaching should be to enable the child to comprehend his material surroundings with a view to his daily life. Every hour he would be inquiring, "How much?" in money, distance, time, or goods, and then he would find the necessity for numerical definiteness. He would then inquire, "How many?" in ounces, pence, shillings, or miles.

He must be able to add, subtract, multiply, and divide in easy numbers and fractions, and to apply these processes in his ordinary daily life. He looked upon the time spent on complicated fractions, stocks, and shares as not arithmetic at all, but as time wasted, because these processes were quite outside the child's experience. This was true also of "clock" and "race" problems; and these mathematical luxuries might well be replaced by something much better and more practical. It was important that counting and measuring should be accomplished by dealing with groups—groups of objects first—and not numbers. The teacher might show three noughts and three crosses, and so enable the child to recognise the equality of the groups. Then should follow the series—one, two, three—and the child should be required to place a particular group in its proper position—as 7 after 6 and before 8. Too much importance could not well be attached to measuring; and the child would quickly discover that an artificial unit was necessary—as a foot-rule or yard-stick. Counting and measuring involve each other. The teacher's great difficulty was to find how these ideas take shape in the mind, as it was upon this basis he had to build in teaching number. Among the child's earliest experiences were the recognition of groups of similar objects and the regular succession of sights, sounds, and movements. The fond parent who heard Johnny, aged three, coming downstairs counting as he came, "1, 2, 3, 7, 11," or even if he succeeded in getting the numbers right, was grievously mistaken if he thought the child was able to count. He had a vague notion of groups of like objects, and had arrived at a recognised stage—that of spurious counting. This was where the teacher comes in, and it was a waste of time to begin number teaching before this point had been reached.

Children frequently confused cardinal and ordinal numbers, and they should be taught to apply the word "two" to two objects, and to recognise them intuitively without counting. He would caution them against beginning with "one." There was no such number as one until they had settled what their unit should be. Two, three, four, etc., could be conveniently taught by dots definitely arranged as the pips on cards or dominoes, and the child must be taught to recognise them intuitively. He must early be taught the relations between the various numbers—3 and 1 to 4, or 3 and 2 to 5—and to analyse the different groups. Because a child could say, "Three and two make five," it must not be concluded that it realised exactly what it was supposed to be doing. Measuring, including weighing, should be continued simultaneously with the instruction in numeration. He recommended the use of Tillich's bricks and kindergarten cubes. Writing results should follow perception, and problems should be used with caution and not be begun too early. He would resolutely discard all such examples as clock, train, and river sums, commercial terms and complicated fractions, in order that a larger part of the time might be devoted to more useful purposes.

Miss A. Lloyd Evans, Principal of the London County Council Fulham Training College, then read a paper on "The Teaching of Number in a Training College." She was of opinion that it was desirable that the student should thoroughly understand "one" method, as the children would naturally suffer if too many methods were adopted. She agreed with the former speaker in the necessity for a thorough knowledge of first principles, and regretted, as do many of us, that every teacher, before proceeding to a training college, does not spend some time in an infants' department. She thought that number concepts should be made more definite, and that there was a danger of teachers using too many colorations in the earlier lessons. As an illustration of this she referred to an incident where a student who was supposed to be giving a lesson on number made a drawing of a bird's nest containing eggs, and devoted most of the time to eliciting particulars about birds, nests, and eggs.

Miss R. Solomon, head-mistress of Commercial Street Jewish Infants' School, read the third paper, on "Teaching Number in an Elementary School." She said that the teaching of number had not made such strides as other branches of study had in recent years. Perhaps it was because many teachers did not realise that they were no longer bound as they used to be, and thus the Code was a scapegoat no longer. The educational break between the infants' and the senior schools should be avoided, and there should be frequent conferences between the teachers of the different departments. Before the age of five and a half or six, all number teaching should be incidental and indirect, and for these children there should be no number lessons on the time-table. This incidental teaching was provided in the object lessons, and also by the use of Froebel's Gifts III. and IV. By dealing with these toys an admirable introduction could be given to the teaching of number. Gifts V. and VI. were also useful for early lessons in fractions and areas. Too large numbers must be avoided, especially in the infants' school. With these gifts, too, ideas of length and surface could be obtained. For instance, each cube had a "square" face with sides one inch in length. Fractions could be illustrated by paper-folding and cutting. The teacher, however, must have a clear idea of the aim in view, or else, notwithstanding the construction of wooden houses, chairs, railway trains, etc., the children would not be properly trained to appreciate mathematical truths. The children should be trained to express things for themselves.

By diagonally folding a square of paper, two right-angled triangles were formed; and by folding it diagonally again, four were formed; and the children soon appreciated that they were four equal isosceles and right-angled triangles. Tablet laying was useful, and clay modelling should be used to show the evolution of the cylinder and the cone from the sphere. In her opinion ruler drawing was quite beyond the capabilities of children of seven. Direct number teaching was necessary even in infants' departments, but not before the age of five and a half or six. All sorts of material

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could be employed—beads, blocks, bricks, and marbles. Symbols could be used quite early, calling "plus" *and*, and "minus" *less*. She would narrow the concrete to one definite form, preferably dots, arranged domino fashion. She next dealt with "place value." She would make the children appreciate the value of numbers up to 20 by analysis, and then proceed to show the value of tens by using sticks tied in bundles of tens. By means of cardboard coins money problems could now be introduced, as the children gain experience in shopping quite early, and that should be utilised. As to tables, it was her opinion that parts should be taught, but certainly not to 6 times 12. Number charts made by the teacher were very useful. A child astonished his mother by asking if she had been taught "gozinter;" and when she expressed ignorance, he said, "Why, 2 gozinter 4 two, and 4 gozinter 12 three." This did not show intelligent memorising.

The discussion which followed showed that teachers have given considerable thought to this question. One lady claimed that the culture value far outweighed the utilitarian, and an inspector entered a plea for the retention of clock and race sums. Surely we should get our intellectual training from problems which will be of real use in life. Time in school is all too short to waste over useless exercises.

AN INTRODUCTION TO BRITISH DECIMAL WEIGHTS AND BRITISH DECIMAL MONEY.

BY P. MADDEN, RETIRED FIRST CLASS HEAD-TEACHER, SCHOOL 253, AT MELBOURNE, AUSTRALIA.

(*Continued from page 489.*)

Short Resumé.

MONEY coins retained: the farthing, the halfpenny, the penny, the shilling, the half-crown, the guinea.

Coins slightly altered: the shilling and the guinea.

Only *one* new coin to be created—a cent = 2½d., or 10 farthings.

COINAGE.

The New Shilling to be 12½ pence.
The Guinea Coin to be 250 pence.
At present—4 farthings = 1d.; 12 pence = 1s.;
21 shillings = 1 guinea, 252 pence.
New Style—4 farthings = 1d.; 12½ pence = new shilling;
20 new shillings = guinea, 250 pence.
This New Style fits exactly into the

DECIMAL MONEY COINS SUGGESTED.

1 farthing	= ¼d. = to be the mil	= 1		
10 farthings	= 2½d. = cent coin	= 10		Mils
10 cents	= 25d. = British dollar	= 100		
10 dollars	= 250d. = guinea	= 1,000		

The New Two-Shilling Piece (25d.) to be called British Dollar.
The Farthing in this New Style to be called Mil.
The Penny and Halfpenny Coins to be used as now.
The New Shilling will be the Half-Dollar, 5 Cents.

Bankers and bank clerks will rejoice over this decimal system of money, because after the G figures, which will take the place of pounds, they will only have to record two figures—the dollars and cents. No one will ask to put into a bank less than a cent—2½d. Customers can pocket anything less. At present clerks have sometimes to book four figures after pounds.

Additional Notes on Money.

The present coins will run concurrently at their proper value on the decimal scale, while new coins are being minted and put into circulation.

The booking of the present principal coins will stand on the new scale as underneath:—

Guinea	=	G1·000	Dollar	=	100 Mils.
Sovereign	=	·960	Florin	=	96 ,,
Half-Sovereign	=	·480	Shilling	=	48 ,,
Crown	=	·240	Sixpence	=	24 ,,
Half-Crown	=	·120	Threepence	=	12 ,,

No break or stoppage need arise, but a gradual drawing into the Mint while alterations are being made. Scarcely any trouble will arise in altering the florin to dollar, as the name and value on its reverse side will be sufficient.

We will expect the cent piece to be made of light mixed metal. It will take the place of the 3d. bit, which will be entirely withdrawn.

The new names—guinea, dollar, cent, and mil—will soon be very familiar. The first is still a well-known name; the use of the second in United States and Canada will make a British dollar popular here, as it will be half the American.

The cent is a necessary name for 2½d. coin, because one hundred will make the new guinea or gold coin.

The name mil is necessary, because it means thousandth of the guinea; it will, on this scale, be properly applied, as the farthing will really become the one-thousandth of the guinea, which it never could be of the sovereign.

The sovereign was the coin which, in attempts hitherto made at decimalising, gave all the trouble, as its hundredths and thousandths would not agree with penny or halfpenny values.

This sovereign was the cause why the pound, florin, cent, and mil scheme of 1853 failed, when finally examined by the 1859 Select Parliamentary Committee presided over by Lord Overstone.

What every British man, woman, and child requires to know is that a coin made of the same gold as the sovereign can easily be made worth tenpence more.

By this decimal method, as soon as the four simple rules are mastered, the teacher can at once introduce the application of these rules to decimal money.

As an example of saving time and lessening labour, take such a problem as: My father has a daily income of £1, 12s. 11½d. How much is that for a common year?

This question, worked in the usual way by factors, requires 46 figures and considerable skill with factors. In the decimal method it would appear as G1·582 × 365, and its answer would be complete in 25 figures, appearing as G577·430 paid in guineas, dollars, and cents. The decimal portion could be paid with seven coins, as indicated by the figures, whereas the 9s. 9½d. attached to the £601 paid as now would be very puzzling to an American, a Frenchman, German, or Italian.

Let me say as a final, this is the only plan of decimalising British money that will not alter values in any shop, for your 4¾d. and 3½d. will be reckoned as 19 and 13 mils respectively.

Little alteration will be observed in the silver coins when altered. Ever since the sixteenth year of the reign of Edward the Third, in 1343, the pound of silver has ceased to be coined into twenty shillings, and therefore since that time the initial £ has been both a misnomer and misapplied. A pound of silver is now coined into sixty-six shillings.

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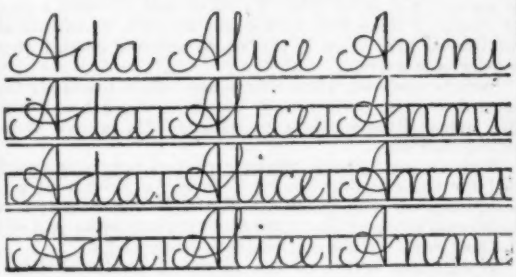

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At present the cost or intrinsic value of silver coins is only 41·6 per cent. of their face value, so we may take it for granted that the change to be made on a florin to convert it into a British dollar would be very slight.

The shillings and sixpences need not be altered for years—they will at any time only be coins of convenience. A half-crown coin = 120 mils, would work well in this decimal scheme.

As gold coins when not left at rest but freely circulated soon lose weight (nineteen years is their average life) and are taken back to the Mint, new gold guineas could gradually take their place. So also of half-sovereigns, whose average life is only eleven years.

Therefore we may reckon that in about twenty years the gold sovereign would be obsolete, and its place taken by the guinea.

French Prize Competition.

1. All French translations **must be received not later than March 7, 1910,** and addressed to:—PRIZE EDITOR, Office of *The Practical Teacher*, 35 and 36 Paternoster Row, London, E.C.
2. Competitors should cut out and send the *coupon* which appears on the Back Wrapper page of the current number. One coupon must be sent for each entry.
3. Competitors should write pseudonym only on MS. Prize-winner will be asked to send name and address for publication.
4. No competitor may take the prize offered more than once in three months.

A Prize of **Half a Guinea** is offered for the best rendering into English of the following extract:—

Il est à peine besoin de rappeler que l'hospitalité s'exerçait aussi dans les châteaux; les seigneurs qui n'étaient pas en querelle se recevaient volontiers les uns les autres; il y avait entre eux des liens de fraternité beaucoup plus étroits que ceux qui existent maintenant entre gens de la même classe. On ne donne plus guère aujourd'hui le logement aux inconnus qui frappent à votre porte; tout au plus et rarement permet-on, à la campagne, aux pauvres de passage de coucher la nuit dans les fenières. Au moyen âge, on accueillait ses égaux, non par simple charité, mais par habitude de politesse et aussi par plaisir. Connu ou non connu, le chevalier voyageur se voyait rarement refuser l'entrée d'un manoir. Sa venue, en temps de paix était une heureuse diversion à la monotonie des jours. Il y avait alors, dans chaque demeure, le hall, la grand'-salle où l'on prenait ses repas en commun; le nouveau venu mangeait avec le lord, à la table transversale placée au fond, à l'endroit appelé le dais; sa suite était aux tables basses disposées dans l'autre sens, le long des murs de la maison. Le souper fini, presque aussitôt on allait dormir; on se couchait et l'on se levait de bonne heure alors. Le voyageur se retirait tantôt dans une chambre spéciale pour les hôtes si le manoir était grand, tantôt dans celle même du maître, le solar (chambre au premier étage) et y passait la nuit avec lui. Pendant ce temps, on avait enlevé du hall les tables basses, car elles n'étaient pas dormantes en général, mais mobiles; on avait disposé des couchettes à terre sur la litière de joncs qui jour et nuit couvrait le pavé, et les gens de la maison, les gens du voyageur, les étrangers de moindre importance s'y étendaient jusqu' au matin.

From La vie nomade et les routes d'Angleterre au XIVe Siècle, par J. J. JUSSERAND.

RESULT OF THE FEBRUARY COMPETITION.

The prize is awarded to "Snowdrop." (Will "Snowdrop" kindly forward name and address for publication?)

First Class.—Napoléon, Trans, Colenso, Jean Bonhomme, Clapham, Caen, K. B., Chillerton, Leonard, Poucette, Society, Galloise, Noel P., Choc, Fas, Southchurch, Arcana imperii, Rosalind, Fiat lux, Essex, Sabaki, Mliss, G. E. N. F., Pressée, Tess, Gabbro, ?, Flooded out, Maggie, Ariel, Gaud, Espérance, Mickie, ——, O. I., Mena, Mavis, F. B., Fleance, Jane, M. L. D., Roma.

Second Class.—Myrtle, Spectator, Ingledene, Madeleine, Kenwyn, Fuss, Wegg, Adelaide, Timon, Borealis, Holt, Black Douglas, R. S. H., Cupido, Vulcan, Curio.

The name and address of "Wellington," to whom last month's prize was awarded, are:—Mr. J. H. Fraser, 22 Warrender Park Terrace, Edinburgh. As Mr. Fraser was awarded the prize for the recent French Verse Competition, and as there was some doubt as to whether the three months' rule applied in his case, he has very kindly consented to waive his claim in the present instance. The prize therefore passes to "Noel," the next on the list. We shall be glad to hear from "Noel" in due course.

REPORT.

No translation sent in was entirely satisfactory. *Le lever* was a difficulty to most. The highest nobles only had the privilege in France of being received in audience by the king while he was at his toilet, and consequently it had neither the publicity nor the general character of the *levée*. *Haute police* is the state or secret police. *N'y ayant ni*, etc., puzzled some. It is only a form of *y avoir*. "Snowdrop" would have done well to have translated *politique* in *politique connue*, etc., more literally, and to have translated *public* as "public."

PRIZE TRANSLATION.

It is all very well to satisfy the public and to gain their esteem. There's no harm in it certainly, and Lafitte is quite right in acting as he does; for, commoner as he is, not duke, public esteem and confidence are the very breath of his nostrils. But a minister's chief aim is to retain his position. In order to succeed he must know, not only what has just happened in Lyons, but what has been said at the private audience. This is not found in the newspapers.

With a free press there can be no conspiracies afoot, so say the members of the Opposition. Needless to say, we are all aware of that fact. But how can a minister save the state, the throne, the monarchy if these have not been threatened by a conspiracy? What is to become of spies and of agents of the secret service? Plots are as inevitable to the maintenance of the higher grades of the police service as scandal is to social life. To hatch and to crush a plot—to charge a mine and to discover it—such is consummate ministerial art. This is the be-all and the end-all of the science of statecraft.

Such is our own admirable policy, which has lately been carried to great perfection by adepts in the art, and which the jealous Saxon strives to imitate. He mimics it in a clumsy fashion.

How on earth can a minister prove his genius and his zeal for the reigning family, if there be neither plot nor conspiracy nor widespread disaffection? What intrigue can be successfully carried out if the whole matter be posted up the first day? What plot can even be devised?

Newspapers reveal to the ministers public opinion—a trivial detail. Newspapers reveal to the public the ministers' acts—a matter of deep interest—or their intentions, a subject of still greater moment. There is no comparison between the two—the gain is all on one side. Moreover, once the ministers' intentions have been made public, they either cannot or will not execute them. "Wisdom known, wisdom flown." It's all one, whether it be of state affairs, state secrets, or state secretaries. In short, secrecy is the soul of politics, publicity is only for the crowd.

"SNOWDROP."

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Our Query Column.

Solutions by A. Clement Jones, M.A., Ph.D., Senior Mathematical Master, Bradford Grammar School.

RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the name and address of the correspondent, and the *coupon* which appears on the back wrapper of the current number of the Journal.
3. Correspondents must in all cases state the source from which their query has been obtained.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Algebra.—If h and k are the roots of the equation

$$(b - x)(c - x) - A^2 = 0,$$

show that for all real values of A, B, C, b, c the expression

$$B^2(b - x) + C^2(c - x) - 2ABC$$

will have values of opposite signs when h and k are successively substituted for x. (Bd. of Education, Hons., 1908.)

The equation $(b - x)(c - x) - A^2 = 0$ can be written

$$x^2 - x(b + c) + bc - A^2 = 0.$$

The roots of this equation, h and k, are real, since

$$(b + c)^2 - 4(bc - A^2) = (b - c)^2 + A^2$$

is essentially positive.

Also $h + k = b + c$,

and $hk = bc - A^2$.

Now since $(b - h)(c - h) = A^2$,

$$B^2(b - h) + C^2(c - h) - 2ABC$$

$$= \frac{B^2(b - h)^2 - 2ABC(b - h) + C^2A^2}{b - h}$$

$$= \frac{[B(b - h) - AC]^2}{b - h},$$

which is the same sign as $(b - h)$, for the numerator is the square of a real quantity, and consequently is positive.

So $B^2(b - k) + C^2(c - k) - 2ABC$ has the same sign as $(b - k)$.

Now $(b - h)(b - k) = b^2 - b(h + k) + hk$

$$= b^2 - b(b + c) + bc - A^2$$

$$= -A^2.$$

Hence, since the product of $(b - h)$ and $(b - k)$ is negative, these, and consequently the expressions depending on them, have opposite signs.

Jack.—A right circular cone of semi-vertical angle 60° is cut by a plane making an angle of 30° with its axis, and cutting that axis at a distance 3 inches from the vertex. Draw the section.

(Filon's *Projective Geometry*.)

The following solution will be clearer if you will first read through my answer to Timmy in the October 1909 number. In that answer I explained at length the method of drawing a projective figure when it is rabatted into the plane of the figure projected. When the figure is rabatted about the axis of projection, it is there shown that the two figures remain in perspective, and our object is to find the position of the centre of perspective and the vanishing line in the rabatted position.

In Fig. 1, V is the vertex of the cone; VA, VB are generating lines of the cone. The plane of the figure contains the axis of the cone, and is perpendicular to the cutting plane. AC′ is the line of intersection of this cutting plane with the plane of the figure. Evidently AA′ are points on the section which we have to draw.

Through A draw a plane perpendicular to the axis of the cone. This plane will cut the cone in a circular section. The intersection of this plane and the plane of the figure is AB, which is a diameter of the circular section.

Now the section we require is the projection of this circular section from the vertex V on the plane represented by AA′, and which, containing this line, is perpendicular to the plane of the figure. Hence the intersection of the plane of the circular section and that of the required section is a line through A perpendicular to the plane of the paper. This is the axis of projection. We propose then to rabat the required section round this axis into the plane of the circular section. The rabatted figure will still be in perspective with the circle.

Now draw VI parallel to AA′ to meet AB at I, and VJ parallel to AB to meet AA′ at J. Now the projection of the point I is the point at infinity on AA′. This is a definite point, hence I still projects into the point at infinity on AA′ in the rabatted position. Also a line through I perpendicular to the plane of the paper projects into the line at infinity in the plane of the required section. This line then is the vanishing line in the figure of the circle.

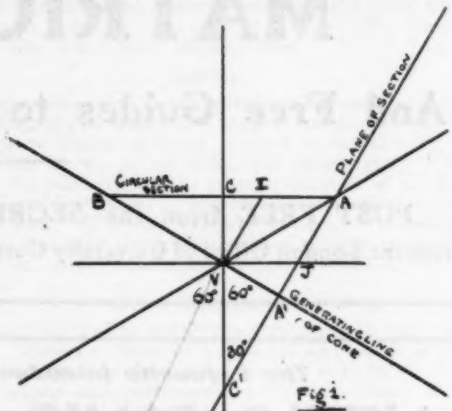
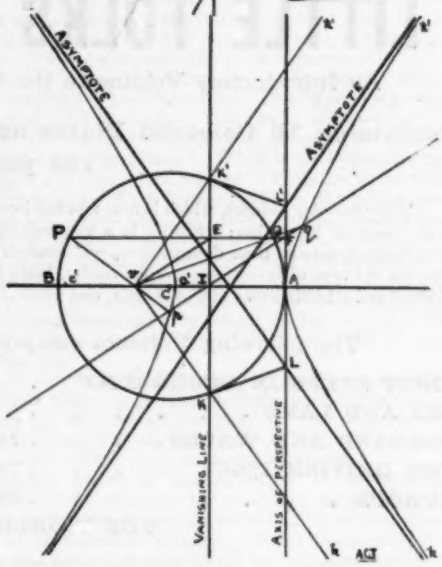


Fig 1.



Again, J is the projection of the point at infinity on BA. It is therefore a fixed point in the figure, and when the section is rabatted J describes a circle about A. But AJVI is a parallelogram, hence V describes a circle about I.

In the next figure the plane of the paper is that of the circular section AB. v is the rabatted position of V, found

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by making Iv = IV (see Fig. 1). The axis of perspective and the vanishing line are both perpendicular to AB. All we now have to do in order to describe the required section is to draw the curve which is in perspective with the circle, v being the centre of perspective, Ik the vanishing line, and AL the axis of perspective.

(a) *To find the asymptotes of the section.* Let the vanishing line cut the circle at k and k'. Draw the tangents to the circle at these points, intersecting the axis of perspective in L and L'.

Now since K is on the vanishing line its projection is the point k at infinity on vK. Again L, being on the axis of perspective, projects into itself. The line through L parallel to vk is therefore the projection of kL. Since kL touches the circle at K, its projection touches the projected figure at k—that is, at infinity—and is therefore an asymptote. So Lk' is the other asymptote, and these being real the section is a hyperbola.

(b) *To find the projection of any point P on the circle.* Draw PQ perpendicular to the axis of perspective, meeting the vanishing line at E, the axis of perspective at F, and the circle at P and Q.

Now the projection of E is the point at infinity on vE, also F corresponds to itself. Hence a straight line through F parallel to vE corresponds to, or is the projection of, EF; therefore the projections of P and Q also lie on this line. But the projections of P and Q lie on vP and vQ respectively, hence vP, vQ meet the line drawn through F parallel to vE at the points p, q required.

We have shown this construction in the figure. The lines of construction of other points, found in the same way, are omitted to save confusion. The section required is the hyperbola shown. Incidentally, since C' (Fig. 1) is on the line AC', it rabats into the position c', where AC' = Ac'. The ordinate of the hyperbola at c' should equal the radius of the circular section through C', which may be verified by measurement. Such confirmatory tests should be noted and applied.

I should recommend you to draw similar figures, when AC' makes angles 60° and 75° with the axis.

J. E. Death.—(i.) Prove that the product of any three consecutive integers is divisible by 6.

(ii.) Prove that the sum of the squares of three consecutive integers is never divisible by 3. (Durham University.)

(i.) When any number is divided by 3, the remainder must be less than 3—that is, the remainder is 0, 1, or 2.

When three consecutive numbers are in turn divided by 3, the remainders must be all different, for if two were the same the difference of the numbers would divide by 3; but this difference is less than 3, which cannot possibly divide by 3.

Hence when three consecutive numbers are divided in turn by 3, the remainders are 0, 1, 2 in some order. In other words, one of the three numbers divides by 3 exactly.

Again, of any two consecutive numbers one is odd and one even. Hence of three consecutive numbers one at least is even, and divides exactly by 2.

Hence the product of three consecutive numbers divides exactly by 2 and 3—that is, by 6.

(ii.) Let the middle number of the three be n; the three consecutive integers are therefore $(n-1)$, n, $(n+1)$. The sum of their squares

$$= (n-1)^2 + n^2 + (n+1)^2$$
$$= n^2 - 2n + 1 + n^2 + n^2 + 2n + 1$$
$$= 3n^2 + 2.$$

That is, this sum, when divided by 3, always leaves a remainder 2.

François.—A point O is taken on the bisector of the angle A of the triangle ABC, and BO, CO are drawn to meet the opposite sides in E and F respectively. Prove that the nearer O is taken to A the more nearly the ratio of AE to AF is equal to unity, and the nearer O is taken to BC the more nearly the ratio BF to CE is equal to AB^2 to AC^2. (B.Sc., London, 1909.)

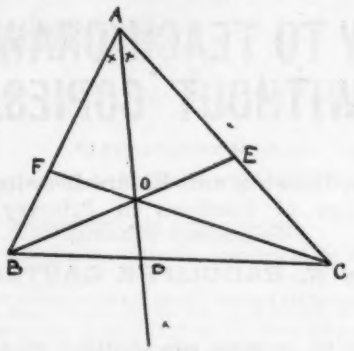
Since the three straight lines AD, BE, CF are concurrent, we have by Ceva's theorem

$$BD \cdot CE \cdot AF = DC \cdot AE \cdot BF;$$

that is,

$$\frac{BF}{CE} \cdot \frac{AE}{AF} = \frac{BD}{DC}.$$

Now, by *Euclid* vi. 3, since AD bisects the angle A of the triangle



$$\frac{BD}{DC} = \frac{AB}{AC}.$$

Hence

$$\frac{BF}{CE} \cdot \frac{AE}{AF} = \frac{AB}{AC}.$$

Case (1). As O approaches A, BF approaches the value BA, and CE approaches the value CA, and in the limit they have these values.

Hence in the *limit* when O coincides with A

$$\frac{BF}{CE} = \frac{BA}{CA} = \frac{AB}{AC},$$

and by our above result

$$\frac{AB}{AC} \cdot \frac{AE}{AF} = \frac{AB}{AC},$$

or limit

$$\frac{AE}{AF} = 1.$$

Case (2). As O approaches the position D, AF and AE approach the values AB and AC. In the limit when O coincides with D, we have

$$\frac{AE}{AF} = \frac{AC}{AB}.$$

Hence

$$\frac{BF}{CE} \cdot \frac{AC}{AB} = \frac{AB}{AC},$$

or limit

$$\frac{BF}{CE} = \frac{AB^2}{AC^2}.$$

Puzzled.—You have not fulfilled the conditions given at the top of our Query Column. You do not state the source of your query. Further, the wording is very ambiguous. Taking even the simplest case—namely, when the cutting planes are orthogonal—the result you require involves elaborate integration, and could not be of any service as a formula.

Probably you have mistaken the intention of the original question.

Katherine.—Differentiate $x^n \log \tan^{-1} x$ with regard to

$$\frac{\sin\sqrt{x}}{x^{\frac{1}{2}}}.$$

(Edwards' *Diff. Calc.*)

Let $y = x^n \log \tan^{-1} x.$

$$z = \frac{\sin\sqrt{x}}{x^{\frac{1}{2}}}.$$

Then

$$\frac{dy}{dx} = nx^{n-1} \log \tan^{-1} x + x^n \cdot \frac{1}{\tan^{-1} x} \cdot \frac{1}{1+x^2}$$
$$= \frac{n(1+x^2) \cdot \tan^{-1} x \cdot \log \tan^{-1} x + x}{(1+x^2) \tan^{-1} x} \cdot x^{n-1},$$

and

$$\frac{dz}{dx} = \frac{1}{x^{\frac{1}{2}}} \cdot \frac{1}{2\sqrt{x}} \cdot \cos\sqrt{x} - \frac{3}{2x^{\frac{1}{2}}} \cdot \sin\sqrt{x}$$
$$= \frac{x^{\frac{1}{2}} \cos\sqrt{x} - 3\sin\sqrt{x}}{2x^{\frac{1}{2}}}.$$

Therefore

$$\frac{dy}{dz} = \frac{dy}{dx} \div \frac{dz}{dx}$$
$$= \frac{[n(1+x^2)\tan^{-1} x \cdot \log \tan^{-1} x + x]}{(x^{\frac{1}{2}} \cos\sqrt{x} - 3\sin\sqrt{x})(1+x^2)\tan^{-1} x} \cdot 2x^{n+\frac{1}{2}}.$$

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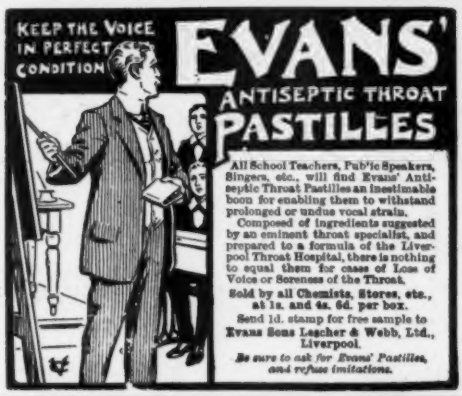
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